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Practice for Connected Mathematics Project

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PRACTICE FOR CMP

Interactive Qualifying Project completed in partial fulfillment
of the Bachelor of Science degree at
Worcester Polytechnic Institute, Worcester, MA

Submitted to:

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Abstract

ASSISTments is an online math tutoring system which has performed numerous studies in order to find ways to improve student learning. The purpose of this study is to see if students benefit from practicing the prior and prerequisite skills relevant to the current Connected Math Project 2 unit. Through the designing and building of the prerequisite problem sets, this and other studies can now be run to help ASSISTments gather data and make great strides in improving student success in the classroom.

Authorship

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Introduction

Many teachers from middle schools around the United States use math textbooks as their main teaching tool in the classroom. ASSISTments has helped many teachers improve their teaching styles by integrating the use of the ASSISTments system in the classroom. One of the ideas ASSISTments has done well is integrate textbooks from different schools into the ASSISTments electronic system. This integration allows teachers to give students assignments and tests electronically via ASSISTments, moving away from the paper systems used in most classrooms. ASSISTments takes care of all of the grading, provides teachers with a detailed progress report of the success of students on each assignment, and the students are also provided with instant feedback on every assistment completed. The main goal is for ASSISTments to be a tool used by teachers in order to help students have better success in their schools' respective mathematics curriculums.

A textbook series used by many schools, including Falmouth Middle School in Falmouth, Maine, is the Connected Mathematics Project 2 series. The Connected Math Project 2 series, also known as CMP2, is composed of eight different units, including: Variables and Patterns, Stretching and Shrinking, Comparing and Scaling, Accentuate the Negative, Moving Straight Ahead, Filling and Wrapping, What do you Expect?, and Data Distributions. These eight units cover 7th Grade Mathematics concepts ranging from writing linear equations to representing sets of data using bar graphs and line plots. The focus of this study was placed on the Connected Mathematics Project 2 curriculum to see if there is a way to optimize the performance of students by having students practice prerequisite skills while working with the appropriate CMP2 unit.

The first goal of the study was to make sure all of the prerequisite skill problem sets for the Connected Mathematics Project 2 curriculum were created in the ASSISTments system. The

problem sets which were already created were also revisited to make sure all of the assistments used were of the proper grade level and prepared students well for the material found in the CMP2 units. Some previously made problem sets were adjusted in the hope that the modifications would provide students with better preparation for the CMP2 units, but many other prerequisite problem sets were built for prerequisite skills which had yet to have content made for them in the ASSISTments system. After researching the CMP2 units an understanding was developed about how the problems were set up for the students. This knowledge was applied in the creation of the assistments for the remaining prerequisite problem sets which had yet to be completed.

In order for ASSISTments to keep track of every problem set ever built and make sure all of their content is organized, each problem set is thoroughly documented. The documentation of each problem set helps people understand how many different types of assistments can be found in a problem set. Therefore in order to keep the study organized and keep track of all of the work being created, all of the problem sets used in this study were documented. All of the documentation and prints of the new problem sets can be found in Appendix A and Appendix B. The documentation for each problem set outlines the assistment templates used in the creation of the problem set. The documentation will contain the assistment number for the problem set, the number of assistment templates which compose the problem set, the assistment numbers of those templates, a visual representation of what the test drive of each assistment looks like, and a bulleted list of the properties of each template. Some of these properties for the assistments, include: standard or variabilized, type of problem, statement of variabilized components, range of variable possibilities, and the answer type. The documentation also helps the researchers figure out the accuracy of the problem sets in relation to the proper CMP2 units.

Following the documentation of every problem set built for the study, a powerpoint advertisement was created to showcase all of the problem which had been made for each of the CMP2 units. The purpose of the powerpoint was to allow the teachers who were participating in the study an easy way to look at all of the problem sets being given to their students. The powerpoint as seen in Appendix D depicts the purpose of the study, a short explanation of the study, and the problem sets made for each of the eight different CMP2 units. The problem sets shown on each of the slides for the CMP2 units includes the on-topic and off-topic skills with problem sets which would be used for a long term study with an experimental group. Each of the problem set numbers is a hyperlink to the public print of the problem set, so anyone can view the actual assistments which compose the problem set. The powerpoint has internal links throughout in order to allow for easy navigation while viewing. The arrows at the bottom of each slide allow anyone to transition from one slide to the next. The left bottom arrow on the slides which have the CMP2 units will allow anyone to transition back to the slide that lists the eight different CMP2 units. Each of the titles of the eight CMP2 units on this slide is an internal hyperlink to the correct corresponding powerpoint slide for that unit. Through the use of the powerpoint advertisement, people can easily view all of the assistments which will be given to the students in the study.

Background

ASSISTments is an online math tutoring system, which was founded by Professor Neil Heffernan in 2003. The goal of the ASSISTments system is to be an easily accessible aid for teachers that will help improve the overall quality of student learning in the classroom. Through funding from the U.S. Department of Education, the National Science Foundation, and the Bill and Melinda Gates Foundation, ASSISTments has been able to grow as a successful web-based tutoring system. In order to improve the success of ASSISTments and its overall effectiveness in the classroom many studies have been carried out and many more will be. These studies provide ASSISTments with valuable statistical data, vital to the future expansion of ASSISTments in the classrooms of students all over the world.

While ASSISTments has been quite successful in building original content to be used by teachers in the classrooms, the next big step was to partner with math textbook manufacturers in order to utilize material from these other sources. Many schools utilize various textbooks to help teach students the required math curriculum, which does not make use of newer technology. Through the advertisement of ASSISTments to schools in the United States, many schools became interested in using ASSISTments as a tool to help teachers teach their students. After talks with many of these school systems, ASSISTments made it a goal to integrate the textbooks used by each school into the ASSISTments system. Therefore the textbooks would be a guide for the student and all of the work could be completed online. Since ASSISTments is an online math tutoring system, teachers no longer need to spend a large amount of their time grading assignments. Teachers now have more time to focus on improving other aspects of their class and gaining better overall results. Through the use of the ASSISTments system, teachers have many new tools which help in gauging the success of a class in an area of the curriculum.

The National Science Foundation(NSF) in the years of 1991-1996 and 2000-2006 helped give birth to the Connected Mathematics Project math curriculum. The Connected Mathematics Project originated at Michigan State University where five teachers, Glenda Lappan, Elizabeth Phillips, Susan Friel, William Fitzgerald, and James Fey, were looking to improve the overall effectiveness of the middle school math program. The Connected Mathematics curriculum was meant to test students on their problem solving abilities, conceptual understanding, and proportional reasoning. The material for the Connected Mathematics Project was split into eight different units, where each unit covers a different subject in the Middle School math curriculum. Through a wide assortment of math problems, students learn and develop new methods for solving each type of problem. The Connected Mathematics curriculum challenges students to develop a higher level of understanding for problems that range in conceptual difficulty. The material found in each unit presents students with an opportunity to think outside the box, improve their critical thinking skills, and become better problem solvers.

In 2010, the National Science Foundation funded the creation of a new Math Center known as the National Research & Development Center on Cognition & Mathematics Instruction. The ASSISTments team was selected to be a joint partner in helping to perform research regarding the middle school mathematics curriculum, Connected Mathematics Project(CMP). The grant given to ASSISTments from the IES Math Center focused on studying ways of providing practice and feedback. The goal of the IES Math Center is to apply cognitive science principles that have worked well in lab experiments, to the redesign of classroom instructional materials and practices in order to benefit the learning of K-12 school children.^{1 2}


¹Schneider, S (2012)

² Kelly, Kim, Neil Heffernan, Cristina Heffernan, Susan Goldman, James Pellegrino, and Deena Soffer Goldstein. *Estimating the Effect of Web-Based Homework*. Publication. N.p., n.d. Web. 18 Feb. 2013.

As part of this Math Center, ASSISTments began its partnership with Jim Pelligrino and Susan Goldman, two lead researchers from the University of Chicago, in order to study feedback and spacing with connection to the CMP2 Curriculum. ASSISTments worked closely with Deena Goldstein and Kevin Dietz, grad students from the University of Chicago, to analyze the CMP2 Curriculum and produce useful documentation based upon their research. For example, each CMP2 book was broken down in a spreadsheet where each of the problems was listed and labeled with the appropriate Connected Math skills. The organization of the problems into different skills allowed Deena and Kevin to identify the prerequisite and prior knowledge skills necessary to begin each CMP2 unit. These prerequisite and prior knowledge skill identifications were formatted into paper documents known as “Deliverables.” These Deliverables were originally created for the Math Center for the purpose of distributing them to teachers teaching the CMP math curriculum. The Deliverables would help change the math curriculum by creating a curriculum with better spacing and feedback for students. Using the Deliverables as a reference, proper skillbuilders could be built to prepare students for all of the CMP2 units. These skillbuilders would allow students to practice the necessary prerequisite and prior knowledge skills to help prepare them for any given unit. The main objective is to see if having students practice the prerequisite and prior knowledge skills using the skillbuilders will help improve their overall performance in each unit.

The skills used in the study were divided into two categories: on-topic and off-topic skills. There was a significant process involved with deciding what skills would be included in each group. The on-topic was largely chosen based on the skills reflected by the content of the books, outlined in the Deliverables. The off-topics on the other hand needed more consideration to assure that they did not assist with the understanding of the core material, which would

significantly skew the results. In the initial setup of a large scope study using all of the books, the off-topic skills typically included content that would be on topic content for other books, past or present. In this setup, the groups would switch and the control group would become the experimental. This leads to students doing some of the skill builders multiple times throughout the school year across the different books. On a short term scale, however, the off-topics were altered slightly because they could be optimized for a better overall study application, as seen in Figure 1. The off-topic skills would not necessarily be a wide-range blend of topics like in the large scale, but more of a preparation for the next book. In this case, because the short term setup only included two books, the off topic skills of one book were the preparation for the next book. Therefore the off-topic skills for the first book were on-topic skills for the second book and off topic skills for the second book were on-topic skills for the first book. So in this case, Group A would get on-topic skills for the first book and off-topic skills for the second book, while Group B would get on-topic for the second book and off-topic for the first book.



Moving Straight Ahead

Click on the number to see the Problem Set.

Prerequisite Skills


- Interpret Coordinate Graphs - [85019](#)
- Point Plotting - [35008](#)
- Interpreting Data - [85018](#)
- Multiplication and Division Decimals - [39659](#)
- Addition and Subtraction Integers - [11898](#)
- Commutative Property - [13718](#)
- Distributive Property - [11901](#)
- Multiplication and Division Integers - [11899](#)
- Parallel and Perpendicular Lines - [95443](#)
- Percent of Increase and Decrease - [34196](#)

Off-Topic Skills

- Counting Methods - [15528](#)
- Area Rectangle - [10710](#)
- Perimeter of a Polygon - [10766](#)
- Area Irregular Figures - [10763](#)
- Theoretical Probability - [8585](#)
- Properties and Classification Circle - [22457](#)
- Finding Fractions and Ratios - [35610](#)
- Scale Factor - [85626](#)
- Similar Figures - [96850](#)
- Unit Conversion within a System - [9056](#)
- Properties and Classification
- Quadrilaterals - [85625](#)

Return to CMP2 Unit List

Go to Filling and Wrapping



Moving Straight Ahead

Click on the number to see the Problem Set.

Prerequisite Skills

- Interpret Coordinate Graphs - [85019](#)
- Point Plotting - [35008](#)
- Interpreting Data - [85018](#)
- Multiplication and Division Decimals - [39659](#)
- Addition and Subtraction Integers - [11898](#)
- Commutative Property - [13718](#)
- Distributive Property - [11901](#)
- Multiplication and Division Integers - [11899](#)
- Parallel and Perpendicular Lines - [95443](#)
- Percent of Increase and Decrease - [34196](#)

Off-Topic Skills

- Acute, Obtuse, Right Angles - [9245](#)
- Area Rectangle - [10710](#)
- Perimeter of a Polygon - [10766](#)
- Area Irregular Figures - [10763](#)
- Elapsed Time - [37824](#)
- Properties and Classification Circle - [22457](#)
- Finding Fractions and Ratios - [35610](#)
- 3rd Angle of a Triangle - [21257](#)
- Properties of Solids - [6150](#)
- Polygons 5 or more - [24173](#)
- Properties and Classification
- Quadrilaterals - [85625](#)

Return to CMP2 Unit List

Go to Filling and Wrapping

Figure 1. Powerpoint advertisement slides showing the off-topic problem sets chosen for both the long term(top) and short term(bottom) studies for Moving Straight Ahead

Methodology

The two experimental groups chosen for the study were made from two 7th Grade classes from Falmouth Middle School in Falmouth, Maine. The experimental groups were split evenly between Sally Bennett and Christopher Driscoll teachers at Falmouth Middle School. Sally Bennett's classes were composed of 53 students, while Christopher Driscoll's classes were composed of 59 students. The students of each teacher were ordered by average from the highest percentage to the lowest percentage, which allowed the students to be listed from the best to worst performing. From this point, students in the list were assigned either an "A" for Group A or a "B" for Group B in alternating fashion. Assigning students to each group in this fashion allowed for the two new groups to be balanced with students of varying academic success. Each of the teachers has an odd number of students, so Group A in both cases will have an extra student in relation to Group B.

The Grade 7 CMP2 books used in the study were Comparing and Scaling and Moving Straight Ahead. Before the Comparing and Scaling unit is taught, Group A is given the on-topic prerequisite and prior knowledge skillbuilders to practice for the current unit. During this time, Group B is given the off-topic skillbuilders carefully chosen for the Comparing and Scaling unit. The roles are reversed when the class transitions to the Moving Straight Ahead unit. Group A is given the carefully chosen off-topic skillbuilders and Group B is given the on-topic prerequisite and prior knowledge skillbuilders to practice for the current unit, listed in Figure 1.

The primary method used in acquiring performance data from the students was through a Pre, Mid, and Post Test. A portion of the Pre and Post Tests were composed of multiple choice problems, which were originally created by the Math Center to be used with the eight 7th Grade CMP2 units. These multiple choice problems were integrated into ASSISTments before being placed into the Pre and Post Tests and can be seen in Appendix E. The remaining portion of the

Pre Test and Post Test, along with the entirety of the Mid Test contained assessments from the prerequisite skillbuilders for each CMP2 unit. The Mid Test is meant to test students' abilities with the prerequisite skills, so the Mid Test was made solely of skillbuilders similar to those used in the Pre and Post Tests, with no core assessment. There was one assessment randomly chosen to be added to the Pre and Post Tests from each prerequisite skillbuilder as defined in the Deliverable for each CMP2 unit. These Pre, Mid, and Post Tests created for each of the CMP2 units are listed with administered dates in Table 1.

Table 1 : Pre, Mid, and Post Tests for each CMP Unit in the Study

| CMP2 Units | Pre Test | Mid Test | Post Test |
|--------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| Variables and Patterns | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |
| Stretching and Shrinking | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |
| Comparing and Scaling | Feb. 14, 2013 | Feb. 22, 2013(sample) | Mar. 5, 2013(sample) |
| Accentuate the Negative | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |
| Moving Straight Ahead | Mar. 8, 2013(sample) | Mar. 22, 2013(sample) | Apr. 1, 2013(sample) |
| Filling and Wrapping | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |
| What Do You Expect? | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |
| Data Distributions | 2013-2014 Study | 2013-2014 Study | 2013-2014 Study |

While the timing of when students take these tests is still largely up to the teacher and will vary slightly between the different classes taking them, the Pre Test should be administered approximately two weeks before the start of the new unit. This will allow for the initial data of the performance of students on both core skills to be taught in the new unit as well as prerequisite skills to be acquired. Following this test, the students will begin to work on their assigned prior skill skillbuilders. The prior skill skillbuilder given to each student will depend on

which group each student is a part of. The “mastery learning” involved in the skillbuilder problem sets will involve answering problems about skills with hints and feedback, until a student can correctly answer three problems consecutively. These are completed as homework assignments and both groups of students are working on them, with the difference being that the experimental students are re-mastering relevant skills whereas the control group is working on other math unrelated to current course material. The skillbuilders assigned during the Comparing and Scaling unit can be seen in Table 2 and the skillbuilders assigned during the Moving Straight Ahead unit can be seen in Table 3.

Table 2: Prior Skill and Prerequisite Skillbuilders Assigned to Students for the Comparing and Scaling CMP2 Unit

| Group A On-Topic Skills | Problem Sets | Group B Off-Topic Skills | Problem Sets |
|--|------------------------|----------------------------------|-----------------------|
| Conversion of Fraction, Decimals, Percents | 40425 | Parallel and Perpendicular Lines | 95443 |
| Percent Of | 37146 | Bar Graphs | 78955 |
| Equivalent Fractions | 39181 | Commutative Property | 13718 |
| Writing Linear Equations from Situations | 118292 | Distributive Property | 11901 |

Table 3: Prior Skill and Prerequisite Skillbuilders Assigned to Students for the Moving Straight Ahead CMP2 Unit

| Group A On-Topic Skills | Problem Sets | Group B Off-Topic Skills | Problem Sets |
|--------------------------------------|-----------------------|--|-----------------------|
| Interpreting Coordinate Graphs | 85019 | Acute, Obtuse, Right Angles | 9245 |
| Point Plotting | 35008 | Area Rectangle | 10710 |
| Interpreting Data | 85018 | Perimeter of a Polygon | 10766 |
| Multiplication Decimals | 39659 | Area Irregular Figures | 10763 |
| Division Decimals | 39659 | Elapsed Time | 37824 |
| Addition and Subtraction Integers | 11898 | Properties and Classifications of a Circle | 22457 |
| Commutative Property | 13718 | Finding Fractions and Ratios | 35610 |
| Distributive Property | 11901 | 3rd Angle of a Triangle | 21257 |
| Multiplication and Division Integers | 11899 | Properties of Solids | 6150 |
| Parallel and Perpendicular Lines | 95443 | Polygons of 5 or More Sides | 24173 |
| Percent of Increase and Decrease | 34196 | Properties and Classifications of Quadrilaterals | 85625 |

Around the time when the students start the new unit they are given the Mid Test as an assessment of their understanding of the prerequisite skills included in the skillbuilders. These are the same skills the experimental group has been working on and the control group has not, so this test should allow researchers to get an idea about the effectiveness of the ASSISTment assignments the students have been working with. The lack of core skills is pretty obvious as the students had not been learning or practicing the core skills at all in this time, so the students should not be tested on material they had not been expected to learn. This also avoids any “testing effect” enhancing student scores about material they do not actually know yet.

When the teacher has completed the unit with the students, they are to take a Post Test before the final which will add to the data collection of the study. This Post Test is very similar to the Pre

Test in that it contains assistments from the same prerequisite skills, but the actual problems chosen are each slightly different from the ones in the Pre Test. The assistments chosen for the Post Test though they are about similar skills as those in the Pre Test.

Results and Discussion

At the time of writing, only the short term study has begun, and the only data obtained thus far is of the Pre Test which can be found in Appendix C. There will be later revisions which will add data, but fortunately the data already obtained has an important function which affects the rest of the study and result. For comparisons to be drawn between the test and control group during each book, and for the two different classes to be mixed into the control and test groups together, the data has to reflect that the students of both classes in both groups perform similarly. This must be significant as well, so as to demonstrate a worthwhile gain (or loss) to practicing the prerequisite skills during the core learning. Descriptive statistics were retrieved for the four categories from the data (displayed in Table 4 below) including the mean, standard deviation, etc.

Table 4: Descriptive Statistics Extracted from Pre Test Data

| | Group A | Group B | Bennett | Driscoll |
|--------------------|----------|----------|----------|----------|
| Mean | 50.17422 | 48.64865 | 47.67857 | 51.31579 |
| Standard Deviation | 15.68892 | 17.23831 | 16.68399 | 16.00256 |
| Number of Students | 41 | 37 | 40 | 38 |
| Maximum | 78.57143 | 78.57143 | 78.57143 | 78.57143 |
| Minimum | 21.42857 | 7.142857 | 7.142857 | 21.42857 |
| Range | 57.14286 | 71.42857 | 71.42857 | 57.14286 |

The mean, standard deviation and number of students in the categories will be important when comparing for similarity, but one thing that is visible from the mean, maximum, minimum, and range values is room for growth. While the maximum displays that some students are actually comfortable with the mix of prerequisite and core skills provided in the Pre Test, the mean shows something very different. With the average scores of students hovering around 50% correct, it is clear that most of the class will benefit from learning the material on the test better. Given that the test was made up of more than the material the students have never seen, even practicing

prerequisite problems should be helpful. This is especially clear when considering the average percentages of correct for each problem, seen in Table 6 below. Particularly in the case of the last problem listed, number 389529, a skill students should have learned before, which was only answered correctly by about 9% of students. Looking for a moment at the minimum, it is also clear that there are students towards the bottom of the distribution who should benefit from not only the extra practice, but also the immediate feedback ASSISTments can provide and the extra attention given by a teacher who can see the numbers. These numbers make it clear that all of the students should benefit from using ASSISTments in addition to their normal class work to help them learn this material, which makes the benefits of running a study like this extend beyond the results for the researchers.

In order to confirm that the test and control groups, A and B, can be compared in the context of the study, a statistical hypothesis test is done. This is also done to check the similarity of Miss Bennett and Mr. Driscoll's classes, as a significant divide between the classes' abilities will affect whether or not the test and control groups within the classes can be combined. To start a hypothesis test, first a hypothesis is needed. Starting with the group comparison, the hypothesis is chosen as Group A is equal to Group B, with equal symbolizing equivalently skilled for the purposes of the study. An alternative hypothesis here is that they are not equal. A significance value of five percent is chosen, which equates to ninety-five percent assurance that what is determined is correct.

Once those things are determined, a t-test is run on the data in order to find a p-value to describe it. This is easily done with a dump of all of the data into an Excel sheet, which returns a p-value from its t-test function given the sets of data. This p-value is compared to the significance to

determine whether or not the null hypothesis is rejected. This is done for both comparing A to B as well as to see if Bennett is equivalent to Driscoll for this study.

Table 5: Statistical Hypothesis Test Necessary Data and T-test => P-Value Results

| | Comparing A to B | Bennett to Driscoll |
|--|--------------------|---------------------|
| Null Hypothesis | $\mu_A = \mu_B$ | $\mu_B = \mu_D$ |
| Alternative Hypothesis | $\mu_A \neq \mu_B$ | $\mu_B \neq \mu_D$ |
| Significance Value | $\alpha = 0.05$ | $\alpha = 0.05$ |
| Experimental Average | Group A: 50.17422 | Bennett: 47.67857 |
| Control Average | Group B: 48.64865 | Driscoll: 51.31579 |
| Experimental Standard Deviation | Group A: 15.68892 | Bennett: 16.68399 |
| Control Standard Deviation | Group B: 17.23831 | Driscoll: 16.00256 |
| P-Value (from t test) | 0.68504 | 0.32885 |

The t-tests yield the p-values listed, which can then be compared to the significance value chosen for the purposes of this study. This comparison shows that $0.68504 > 0.05$ and $0.32885 > 0.05$, therefore the null hypothesis is not rejected in either case. Given a lack of evidence to reject, it can be safely inferred that the null hypothesis can be accepted in this case, meaning that there is significant support of the way the students in both classes are grouped, as well as significant validity to results found from the administered tests in this study.

Looking at the breakdown of the scores by question, interesting things can be seen about the problems themselves and what kinds of predictions about the future of the study can be made. For example, the three lowest averages of correctness are on three of the four questions about prerequisite skills. On the other hand, more than seventy-five percent of students correctly answered three of the core skill questions, one of which ninety-one percent answered correctly. It is possible that the low scores on the prerequisites were due to a large time gap between the most recent study of those skills and the time of the test for the students. It is also possible that

previous exposures to core materials, including some crossover on topics in other CMP books, could have been the cause of high scores in the core material.

Between the results yet to be collected from this short study and the future results of a year long iteration of the study, there is a lot of room for more substance to be added to the results. Data from both the Mid Test and the Post Test will be collected and added to Table 6 below as well as analyzed in a number of ways independently. This will allow for researchers taking on the study going forward to try to draw connections and make conclusions about the study and what ASSISTments has to offer to students in this regard. With that future data, it will be possible to chart students' progress to look at the effect of the prerequisite skillbuilders on the core skills. It will be possible to test whether or not the classes and groups remain comparable, like they were shown to be above, throughout a long term study. It will be possible to increase or decrease practice for students if it helps them to learn the core material better. After a long term study, it will be possible to compare the results of the long term study against those of this short term study to see if the prerequisite practice helps more over a longer period of time. Additionally, the performance for all of the prerequisite skills could help researchers and ASSISTments staff to make recommendations for focus on topics students are not performing well on earlier in their academic careers. There is a lot of potential with this data and more so once additional data is collected as the study continues.

It is worth mentioning here that in the current unit, Comparing and Scaling, the Mid Test data will be excluded from consideration due to problems with the assignment of the test. Some of the students took the Mid Test before they should have for the purposes of the study, and to avoid excluding a lot of students, the Mid Test data will be excluded instead. Fortunately this is not something that should skew the study adversely, as the change from the Pre to Post tests is what

is largely important. Of course any study taking place in an environment like middle school is going to have hiccups like these, largely due to unexpected behavior unrelated to the study coming into play. Here that unexpected behavior was students simply moving on too quickly.

Table 6: Averages of Individual Skills in the Tests

| Skill | Pre Test average | Mid Test average | Post Test average | Gain |
|-----------------------|------------------|------------------|-------------------|------|
| Comparing and Scaling | | | | |
| 381039 (core) | 39.74359 | Data Excluded | | |
| 381040 (core) | 55.12821 | | | |
| 381041 (core) | 75.64103 | | | |
| 381042 (core) | 37.17949 | | | |
| 392961 (core) | 57.69231 | | | |
| 381049 (core) | 42.30769 | | | |
| 381050 (core) | 47.43590 | | | |
| 381051 (core) | 35.89744 | | | |
| 381052 (core) | 91.02564 | | | |
| 381053 (core) | 87.17949 | | | |
| 253272 (pre) | 25.97403 | | | |
| 227784 (pre) | 21.79487 | | | |
| 244872 (pre) | 66.66667 | | | |
| 389529 (pre) | 8.974359 | | | |
| Moving Straight Ahead | | | | |
| 393390 (core) | | | | |
| 393391 (core) | | | | |
| 393392 (core) | | | | |
| 393393 (core) | | | | |
| 393394 (core) | | | | |
| 393395 (core) | | | | |
| 393396 (core) | | | | |
| 393397 (core) | | | | |
| 393398 (core) | | | | |
| 393399 (core) | | | | |
| 99173 (pre) | | | | |
| 203640 (pre) | | | | |
| 99363 (pre) | | | | |
| 373425 (pre) | | | | |
| 373308 (pre) | | | | |
| 99429 (pre) | | | | |





Conclusions and Recommendations

At the time of writing, there are not many conclusions easily reachable, given the small amount of data available. The data so far tells a short story, but one that has no middle or end yet, and will need to be filled in by researchers taking over on this going forward. The data collected so far does show us that there is a need for more practice on problems not just in the core skillset of the unit but on skills students should already have by now. Considering some of the low scores on prerequisites, it is clear that even the students at the top of the classes, who do not typically struggle with the material, are not remembering the skills from previous years that are essential to learning the new units. Between indicating that even those students at the top need help, and keeping track of the kids who score the lowest to show teachers that they also need help, ASSISTments and this study have a lot to offer these students. More than the students in the classes now, this study and the results taken from it have the potential to help future generations of students entering this unit, as the results of this study could impact how core units and the homework assigned for them is structured.

There will be other researchers who will take this on and run this study again, as early as next year, to do a long term version for the entire year with the students. This project has been largely about setting things up for these other researchers to take over, and they will be able to take this work as a template for how to run it in the future. They will be able to fill in the tables in this very report if need be to finish this study out and when they run it again. The content built for this project, all of which is in the Appendices below, will be used and assigned to students in the way that was set up here for this small study. There are even marketing materials in the form of a slideshow, in Appendix D, which will likely be used to get more schools on board for a larger study in the future.

In both the study being run now, as well as the larger future study, a procedure will be followed for each unit. It will be best to keep tightly to this procedure for the sake of consistency of the data. The procedure is listed in Table 7 below, with check marks indicating what steps have been completed so far for Comparing and Scaling, and will be followed with Moving Straight Ahead.

Table 7: Steps for Each Unit, with Progress for Current Unit (Comparing and Scaling)

| Complete | Steps to Complete |
|---|--|
|  | Assign all of the material in ASSISTments necessary for study |
|  | Give participating teachers instructions for how to proceed |
|  | Have teachers assign Pre Test |
|  | The teachers assign skillbuilders one or two weeks before beginning the unit |
| Excluded | Just before the unit begins, teachers give Mid Test |
| | The unit is taught |
| | At the end of the unit, the Post Test is given |
| | Collect/collate all data from this unit |
| | Repeat for next unit |

Getting more schools on board to participate is key. As with any study, the results have that much more impact when the population size is as large as possible. Of course, keeping track of comparing many more schools with many more students will mean things like the statistical hypothesis testing will be incredibly important and likely done multiple times just at the beginning. This is especially true if schools from across the nation are used, to be sure that they are comparable enough to look at together. Considering different background and cultures, this may actually not be the case, and researchers may need to account for that in some way. With

ASSISTments reaching students nationwide, including other parts of the country is important because if there are regional needs of students, that has to become clear to ASSISTments administrators. It would be easier to make arrangements and cater learning to students in other parts of the country if studies have demonstrated a need to.

References

1. Schneider, S (2012). Accessed 1/28/13 at <http://www.iesmathcenter.org/home/index.php>.
2. Kelly, Kim, Neil Heffernan, Cristina Heffernan, Susan Goldman, James Pellegrino, and Deena Soffer Goldstein. *Estimating the Effect of Web-Based Homework*. Publication. N.p., n.d. Web. 18 Feb. 2013.

Appendices

Appendix A: Documentation & Problem Sets Created by Brent McGrath

This appendix contains all of the documentation for the assistment parent templates created by Brent McGrath for the problem sets used in the study. Following the documentation, example instances of the parent assistments found in each problem set are shown. Sample problem sets were created in order to provide an example of each type of assistment used in each problem set for the various skills.

| Skills | Links |
|--------------------------------|---|
| Table | http://goo.gl/izR0N (DOC) http://goo.gl/2BYs7 (Sample Problem Set Print) |
| Interpret Data | http://goo.gl/KLlun (DOC) http://goo.gl/5qxQq (Sample Problem Set Print) |
| Interpreting Coordinate Graphs | http://goo.gl/3OYLp (DOC) http://goo.gl/wAlMr (Sample Problem Set Print) |
| Similar Figures | http://goo.gl/6zCPW (DOC) http://goo.gl/Yh7RV (Sample Problem Set Print) |

Appendix B: Documentation & Problem Sets Created by James Beaulieu

This appendix contains all of the documentation for the different assistment types created by James Beaulieu, which were used in the study. The documentation of the assistments used in each problem set is followed up by visuals of the assistments from the student perspective.

| Skills | Links |
|----------------------------------|---|
| Equally Likely | http://goo.gl/svwb0 (DOC) http://goo.gl/YGgG1 (Sample Problem Set Print) |
| Bar Graphs | http://goo.gl/dNLTY (DOC) http://goo.gl/jrbfO (Sample Problem Set Print) |
| Scale Factor | http://goo.gl/pWtjg (DOC) http://goo.gl/kTKMZ (Sample Problem Set Print) |
| Writing Equations | http://goo.gl/XeyAg (DOC) http://goo.gl/zesqp (Sample Problem Set Print) |
| Parallel and Perpendicular Lines | http://goo.gl/ZCJgi (DOC) http://goo.gl/6NSht (Sample Problem Set Print) |

Appendix C: Pre Test Data Spreadsheet

This appendix provides the spreadsheet which contains all of the data collected from the completion of the Pre Test by the two experimental groups in the study.

Link: <http://goo.gl/GPDRH> (pdf)

Appendix D: Powerpoint Advertisement for Study

This appendix contains the powerpoint which was made to advertise the on-topic and off-topic skill problem sets created for the long term CMP2 study.

Links: <http://goo.gl/zPBzF> (pdf)
<http://goo.gl/AdQRm> (Presentation)

Appendix E: CMP Test Questions Created by the Math Center

The National Research & Development Center on Cognition & Mathematics Instruction, aka the Math Center, created test questions based upon the data collected from the CMP Curriculum. The test questions were integrated into ASSISTments and are shown here.

See Figure 1 for CMP Test Questions, which can be found in the Pre Test Problem Sets.

Appendix A: Documentation & Problem Sets Created by Brent McGrath

Appendix A.1.1: Table Skill Documentation

| Skill | Common Core State Standard |
|-------|----------------------------|
| Table | 6.SP.4 |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 84929 | 7 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

| | |
|--------|--------------|
| 337379 | 14 instances |
| 337432 | 14 instances |
| 337455 | 14 instances |
| 341667 | 14 instances |
| 341890 | 14 instances |
| 342423 | 14 instances |
| 343241 | 14 instances |

Templates:

337379

Assistment ID: 337379 [Comment on this question](#)

A few athletes participated in a race and their times are listed below:

| Race Participants | Time of Race (in minutes) |
|-------------------|---------------------------|
| Matt | 5.59 |
| Fred | 5.09 |
| Cassie | 5.5 |
| Mary | 5.44 |
| Todd | 5.2 |
| Marcus | 5.11 |
| Rachel | 5.76 |

How long did it take Matt to finish the race?
(Do not include units, minutes in your answer)

Type your answer below (mathematical expression):

- The above problem is a variabilized template.
- The people participating in the race are selected from a set of strings, including: students, runners, athletes, and friends.
- The race participants listed in the table: Matt, Fred, Cassie, Mary, Todd, Marcus, and Rachel are not variabilized.
- All of the race times in the table are random values that can range from 2.00 to 9.99. However, in any instance the times will only vary by 0.99. Therefore the actual range of the values shown in the problem can be 2.00 - 2.99, 3.00 - 3.99, etc. for any instance.
- The name of the race participant, whom the student is asked to write his/her race time into the answer field is selected from a set of strings, including: Matt, Fred, Cassie, Mary, Todd, Marcus, and Rachel.
- Therefore any of the seven racers can be stated within the problem for the student to type in his/her corresponding race time.
- The answer is formatted as Algebra.

337432

Assistment ID: 337432

[Comment on this question](#)

A group of friends made a table of how many emails and text messages they had received the day before. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 35 | 23 |
| Emily | 24 | 11 |
| Francisco | 18 | 17 |
| Stephanie | 29 | 27 |
| Ashley | 31 | 11 |

How many text messages did Stephanie receive?

Type your answer below (mathematical expression):

Submit Answer

- The above problem is a variabilized template.
- The friends listed in the table: Jared, Emily, Francisco, Stephanie, and Ashley are not variabilized.
- The numbers for the number of text messages received by each friend is a random number from 6 to 35.
- The numbers for the number of emails received by each friend is a random number from 8 to 30.
- The name of the person, whom the student is asked to write how many text messages he/she received into the answer field is selected from a set of strings, including: Jared, Emily, Francisco, Stephanie, and Ashley.
- The student will always be asked to answer the number of text messages a specific person received.
- The answer is formatted as Algebra.

337455

Assistment ID: 337455

[Comment on this question](#)

A group of friends made a table of how many emails and text messages they had received on Monday of last week. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 31 | 19 |
| Emily | 11 | 9 |
| Francisco | 32 | 26 |
| Stephanie | 34 | 26 |
| Ashley | 22 | 10 |

How many emails did Stephanie receive?

Type your answer below (mathematical expression):

Submit Answer

- The above problem is a variabilized template.
- The friends listed in the table: Jared, Emily, Francisco, Stephanie, and Ashley are not variabilized.
- The numbers for the number of text messages received by each friend is a random number from 6 to 35.
- The numbers for the number of emails received by each friend is a random number from 8 to 30.
- The name of the person, whom the student is asked to write how many emails he/she received into the answer field is selected from a set of strings, including: Jared, Emily, Francisco, Stephanie, and Ashley.
- The student will always be asked to answer the number of emails a specific person received.
- The answer is formatted as Algebra.

341667

Assisment ID: 341667 [Comment on this question](#)

The teacher gave the class a survey about which subject they enjoyed the most. The results are shown below:

| Class Subjects | Percentage of Males | Percentage of Females |
|----------------|---------------------|-----------------------|
| Math | 4% | 12% |
| Science | 16% | 50% |
| English | 60% | 16% |
| History | 20% | 22% |

What percentage of males enjoyed Math the most?

Type your answer below (mathematical expression):

- The above problem is a variabilized template.
- The friends class subjects listed in the table under Class Subjects do not change, therefore the nonvariabilized class subjects are always: Math, Science, English, and History.
- The numbers for all of the percentages are based upon the class having 100 total students and a specific number of them are male and female.
- The number of males is a random number between 20 and 80. Therefore the number of females is calculated by taking the number of males and subtracting it from 100.
- In order to determine the number of people who enjoy each subject, the number is randomly generated based upon a fourth of the total gender in the class and the lowest is a base of 2. Therefore for the Males' Math, Science, and History class subjects range from 2 to $\frac{1}{4}$ of the entire male gender in the class plus 1 and the Females' Math, History, and English class subjects range from 2 to $\frac{1}{4}$ of the entire female gender in the class plus 1.
- The percentages for each class subject are directly representative of the number of people who enjoyed each subject the most because the number of people who enjoyed each subject the most is divided by the total number of students of that gender in the class multiplied by 100 to get a percent.
- The percentage of a gender that the question is asking you to look for can be either male or female.
- The class subject being asked about within the question can change between the four different class subjects: Math, Science, English, and History.
- The answer can be written as the percentage value with or without the % sign.
- The answer is formatted as Algebra.

341890

Assessment ID: 341890 [Comment on this question](#)

The chart below shows temperatures, in degrees Fahrenheit, for a seven-day period in February.

| Date | Temperature |
|-------------|-------------|
| February 14 | 54 ° F |
| February 15 | 28 ° F |
| February 16 | 63 ° F |
| February 17 | 39 ° F |
| February 18 | 33 ° F |
| February 19 | 70 ° F |
| February 20 | 46 ° F |

On what date was it 33 ° F outside? [Remember Months are capitalized.](#)

Type your answer below:

- The above problem is a variabilized template.
- The months and days listed in the first column of the table are both variabilized.
- The month comes from a set of strings, which includes the months: September, October, November, December, January, February, and March.
- The days can range from 1 to 29, to allow for any possible week combination in any of the months listed, including February on a leap year.
- All of the temperature values are randomized and are all interrelated to one another. The base temperature can be seen at the second temperature which is a number from 3 to 30. All of the other temperatures are increased in a specified order, which appears random to the students. Therefore I could allow the temperatures to all be unique values and could all be realistic.
- The degree asked for in the question to the student can come from any of the temperatures in the second column of the table.
- The answer for the month and date of the asked temperature will always be the month and day to the left of the temperature value in the table.
- The student needs to capitalize the month in the answer, but a month and day with no spaces and a month and a day with one space is accepted as a correct answer.
- The answer is formatted as Fill In.

342423

Assistment ID: 342423 [Comment on this question](#)

The gift shop at the museum was selling handcrafted souvenir necklaces. The prices for the necklaces are listed below:

| | | | | | | |
|-------------------|--------|---------|---------|---------|---------|---------|
| # of Necklaces | 1 | 2 | 3 | 4 | 5 | 6 |
| Price of Purchase | \$6.35 | \$12.70 | \$19.05 | \$25.40 | \$31.75 | \$38.10 |

How much do 3 necklaces cost?
(Do not include units, \$, in your answer)

Type your answer below (mathematical expression):

- The above problem is a variabilized template.
- The item being sold as a handcrafted souvenir in the museum gift shop is a string within a set, which includes: mugs, glasses, banners, blankets, necklaces, and wallets.
- The unit price of each item is a random number from \$5.00 to \$9.99.
- Each of the following prices after the first one, is an integer multiple of the individual price for the item. Therefore the second item is the individual price multiplied by 2, the third item is the individual price multiplied by 3, and so on.
- The number of items asked for in the question within the problem, which the student is supposed to figure out the price for is a random number between 1 and 6.
- The item also being asked for in the question within the problem can be any of the six items listed above.
- Therefore the answer is always the dollar amount of the correct corresponding number of the stated item within the problem. The student is reminded not to include a dollar sign in his/her answer.
- The answer is formatted as Algebra.

343241

Assistment ID: 343241

[Comment on this question](#)

Three math classes took a poll to see what pets students have at home. The results were gathered and put into the table below:

| | Dogs | Cats | Fish | Birds | Rabbits |
|-------------|------|------|------|-------|---------|
| Class One | 18 | 8 | 4 | 5 | 9 |
| Class Two | 24 | 25 | 5 | 2 | 4 |
| Class Three | 30 | 25 | 4 | 6 | 5 |

How many total dogs did Class One have?

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

- The above problem is a variabilized template.
- The five different types of animals in the problem is always constant and they are: Dogs, Cats, Fish, Birds, and Rabbits.
- The number of pets for each class are completely randomized, but each type of pet has a different randomized range.
- The number of Dogs per class is a random number from 6 to 35.
- The number of Cats per class is a random number from 6 to 35.
- The number of Fish per class is a random number from 3 to 14.
- The number of Birds per class is a random number from 2 to 9.
- The number of Rabbits per class is a random number from 2 to 9.
- The type of animal asked for in the question within the problem, is a string within a set that can be one of the following: dogs, cats, fish, birds, or rabbits.
- The Class also being asked for in the question within the problem can be any of the three classes, therefore the question will ask for Class One, Class Two, or Class Three.
- The answer is formatted as Algebra.

Appendix A.1.2: Table Skill Sample Problem Print

Problem Set "Table Problem Set - sample assistments" id:[154558]

1) Assistment #373124 "373124 - Race Table"

A few friends participated in a race and their times are listed below:

| Race Participants | Time of Race (in minutes) |
|-------------------|---------------------------|
| Matt | 2.63 |
| Fred | 2.2 |
| Cassie | 2.68 |
| Mary | 2.81 |
| Todd | 2.37 |
| Marcus | 2.77 |
| Rachel | 2.69 |

How long did it take Todd to finish the race?
(Do not include units in your answer)

Algebra:

✓ 2.37

Hints:

- Find Todd's name in the table.
- Look to the right of the Todd's name for the correct time.

Type in 2.37

2) Assistment #373138 "373138 - Message Table"

A group of friends made a table of how many emails and text messages they had received the day before.
The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 33 | 30 |
| Emily | 27 | 27 |
| Francisco | 18 | 16 |
| Stephanie | 34 | 23 |
| Ashley | 31 | 8 |

How many text messages did Emily receive?

Algebra:

✓ 27

Hints:

- First, find the column for the # of Text Messages.

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 33 | 30 |
| Emily | 27 | 27 |
| Francisco | 18 | 16 |
| Stephanie | 34 | 23 |
| Ashley | 31 | 8 |

- Next, find Emily's name.
- Lastly, look to the right of Emily's name for the correct # of Text Messages.

Type in 27

3) Assistent #373152 "373152 - Message Table"

A group of friends made a table of how many emails and text messages they had received on Monday of last week. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 8 | 11 |
| Emily | 13 | 30 |
| Francisco | 21 | 16 |
| Stephanie | 32 | 26 |
| Ashley | 18 | 12 |

How many emails did Stephanie receive?

Algebra:

✓ 26

Hints:

- First, find the column for the # of Emails.

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 8 | 11 |
| Emily | 13 | 30 |
| Francisco | 21 | 16 |
| Stephanie | 32 | 26 |
| Ashley | 18 | 12 |

- Next, find Stephanie's name.
- Lastly, look to the right of Stephanie's name for the correct # of Emails.

Type in 26

4) Assisment #373166 "373166 - Class Subject"

The teacher gave the class a survey about which subject they enjoyed the most. The results are shown below:

| Class Subjects | Percentage of Males | Percentage of Females |
|----------------|---------------------|-----------------------|
| Math | 25% | 26% |
| Science | 23% | 53% |
| English | 27% | 14% |
| History | 25% | 7% |

What percentage of males enjoyed English the most?

Algebra:

✓ 28

✓ 28%

Hints:

- First, find the column for the Percentage of males.
- Next, find the class subject, English.
- Lastly, look to the right of the subject, English, under the column for the Percentage of males.

Type in 28

5) Assisment #373180 "373180 - Date Temperatures"

The chart below shows temperatures, in degrees Fahrenheit, for a seven-day period in September.

| Date | Temperature |
|--------------|-------------|
| September 7 | 40°F |
| September 8 | 29°F |
| September 9 | 44°F |
| September 10 | 35°F |
| September 11 | 33°F |
| September 12 | 49°F |
| September 13 | 37°F |

On what date was it 35°F outside? Remember Months are capitalized.

Fill in:

✓ September 10

✓ September10

Hints:

- Find the Temperature that is equivalent to 35 in the Temperature column.
 - Look to the left of the correct temperature in order to figure out the date on which it occurred.
- Type in September 10

6) Assistent #373194 "373194 - Museum Souvenir Table"

The gift shop at the museum was selling handcrafted souvenir blankets. The prices for the blankets are listed below:

| # of Blankets | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------|--------|---------|---------|---------|---------|---------|
| Price of Purchase | \$5.92 | \$11.84 | \$17.76 | \$23.68 | \$29.60 | \$35.52 |

How much do 3 blankets cost?

(Do not include units, \$, in your answer)

Algebra:

✓ 17.76

Hints:

- Find the correct number of blankets in the top row of the table.
 - Look below the cell of 3 blankets to find the correct corresponding price.
- Type in 17.76

7) Assistent #373208 "373208 - Pets Table"

Three math classes took a poll to see what pets students have at home. The results were gathered and put into the table below:

| | Dogs | Cats | Fish | Birds | Rabbits |
|-------------|------|------|------|-------|---------|
| Class One | 29 | 26 | 3 | 3 | 6 |
| Class Two | 26 | 27 | 6 | 3 | 4 |
| Class Three | 32 | 12 | 13 | 8 | 7 |

How many total dogs did Class Three have?

Algebra:

✓ 32

Hints:

- First, find the column for Dog.
 - Next, find the row Class Three.
 - Lastly, look to the right of Class Three and follow the row until it reaches the Dog column.
- Type in 32

Appendix A.2.1: Interpret Data Skill Documentation

| Skill | Common Core State Standard |
|----------------|----------------------------|
| Interpret Data | 6.SP.4 |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 85018 | 20 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

Table

356713 4 instances
356714 4 instances
356715 4 instances
356717 4 instances

Stem and Leaf Plot

355803 4 instances
356198 5 instances
356232 5 instances
357972 5 instances

Line Plot

334250 4 instances
338607 4 instances
338654 4 instances
338663 4 instances

Box and Whisker

355802 16 instances

Circle Graph

355780 8 instances

355791 8 instances

Bar Graph

358531 3 instances

358589 3 instances

358601 4 instances

361959 3 instances

361960 3 instances

Templates:

356713

Assistment ID: 356713 [Comment on this question](#)

A few friends participated in a race and their times are listed below:

| Race Participants | Time of Race (in minutes) |
|-------------------|---------------------------|
| Matt | 6.5 |
| Fred | 6.62 |
| Cassie | 6.69 |
| Mary | 6.59 |
| Todd | 6.97 |
| Marcus | 6.36 |
| Rachel | 6.12 |

Who finished the race with the slowest time?
The slowest time is the largest number of minutes in the table.

Type your answer below:

- The above problem is a variabilized template.
- The people participating in the race are selected from a set of strings, including: students, runners, athletes, and friends.
- The race participants listed in the table: Matt, Fred, Cassie, Mary, Todd, Marcus, and Rachel are not variabilized.
- All of the race times in the table are random values that can range from 2.00 to 9.99. However, in any instance the times will only vary by 0.99. Therefore the actual range of the values shown in the problem can be 2.00 - 2.99, 3.00 - 3.99, etc. for any instance.
- The problem body will ask for the name of the person who either had the slowest race time or the fastest race time.
- In the problem body is guaranteed to only have one slowest time or one fastest time, based upon how the values for the times are calculated.
- The name of the race participant for the answer to the question in the problem body can be any of the following names: Matt, Fred, Cassie, Mary, Todd, Marcus, and Rachel.
- The correct answer can either be the capitalized version of the correct name or the all lowercase version of the name.
- The answer is formatted as Fill In.

356714

Assistment ID: 356714 [Comment on this question](#)

A group of friends made a table of how many emails and text messages they had received the day before. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 16 | 21 |
| Emily | 5 | 11 |
| Francisco | 9 | 16 |
| Stephanie | 21 | 28 |
| Ashley | 6 | 21 |

Who received the least number of text messages?

Type your answer below:

- The above problem is a variabilized template.
- The friends listed in the table: Jared, Emily, Francisco, Stephanie, and Ashley are not variabilized.
- The problem body can either ask for the least number of text messages or the most text messages received by a friend.
- If the problem body asks for the most text messages, the friend with the maximum number of text messages can have a value between 18 and 36. All of the other numbers for the text messages received numbers by the other friends is based upon this value and is a random number from 0 to this max value minus 1.
- If the problem body asks for the least number of text messages, the friend with the minimum number of text messages can have a value between 0 and 11. All of the other numbers for the text messages received numbers by the other friends is based upon this value and is a random number between the minimum value plus 1 and 47.
- The numbers for the number of emails received by each friend is a random number from 8 to 30.
- Any of the names in the table of the problem body can be the correct answer to the question. Therefore the answers are: Jared, Emily, Francisco, Stephanie, and Ashley.
- The correct answer can either be the capitalized version of the correct name or the all lowercase version of the name.
- The answer is formatted as Fill In.

356715

Assistment ID: 356715 [Comment on this question](#)

A group of friends made a table of how many emails and text messages they had received on Monday of last week. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 6 | 9 |
| Emily | 11 | 5 |
| Francisco | 6 | 9 |
| Stephanie | 35 | 5 |
| Ashley | 30 | 17 |

Who received the most emails?

Type your answer below:

- The above problem is a variabilized template.
- The friends listed in the table: Jared, Emily, Francisco, Stephanie, and Ashley are not variabilized.
- The numbers for the number of text messages received by each friend is a random number from 6 to 35.
- The problem body can either ask for the least number of emails received or the most emails received by a friend.
- If the problem body asks for the most emails, the friend with the maximum number of emails can have a value between 16 and 28. All of the other numbers for the emails received by the other friends is based upon this value and is a random number from 0 to this max value minus 1.
- If the problem body asks for the least number of emails, the friend with the minimum number of emails can have a value between 0 and 9. All of the other numbers for the emails received by the other friends is based upon this value and is a random number between the minimum value plus 1 and 38.
- Any of the names in the table of the problem body can be the correct answer to the question. Therefore the answers are: Jared, Emily, Francisco, Stephanie, and Ashley.
- The correct answer can either be the capitalized version of the correct name or the all lowercase version of the name.
- The answer is formatted as Fill In.

356717

Assistent ID: 356717 [Comment on this question](#)

The chart below shows temperatures, in degrees Fahrenheit, for a seven-day period in March.

| Date | Temperature |
|----------|-------------|
| March 11 | 43° F |
| March 12 | 38° F |
| March 13 | 31° F |
| March 14 | 46° F |
| March 15 | 35° F |
| March 16 | 26° F |
| March 17 | 41° F |

On what date was the temperature the coldest? **Remember Months are capitalized.**

Type your answer below:

- The above problem is a variabilized template.
- The months and days listed in the first column of the table are both variabilized.
- The month comes from a set of strings, which includes the months: September, October, November, December, January, February, and March.
- The days can range from 1 to 29, to allow for any possible week combination in any of the months listed, including February on a leap year.
- All of the temperature values are randomized and are all interrelated to one another. These values can appear in any row of the table at any time. The base temperature is a number from 3 to 30. All temperatures are unique values and are all realistic.
- The question asks for the student to either figure out what the coldest or hottest day during the seven day period was and type the correct month and day into the answer field.
- The student needs to capitalize the month in the answer, but a month and day with no spaces and a month and a day with one space is accepted as a correct answer.
- The answer is formatted as Fill In.

355803

Assistent ID: 355803

[Comment on this question](#)

The following stem and leaf plot shows the number of glasses sold each week at a store. According to this plot, what is the lowest number of glasses sold in a week?

Glasses Sold Each Week

| Stem | Leaf |
|------|------------------------|
| 2 | 2, 2, 3, 4, 5, 6, 6, 7 |
| 3 | 2, 3, 6, 8 |
| 4 | 7, 8 |
| 5 | 2, 2, 3, 3, 3, 3 |

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

- The above problem is a variabilized template.
- The question in the problem body has the possibility of asking for each of the following: lowest number, greatest number, and mode.
- The item being sold by the store is variabilized and comes from a set of strings, including: shoes, clothes, sweaters, and glasses.
- The first stem is a random number from 1 to 5, while the other stems are incremented up by 1 for every successive stem below the first.
- The first row leaves are eight distinct random numbers ranging from 1 to 9. The values are always in increasing order.
- The second row leaves are four distinct random values ranging from 1 to 9. The values are always in increasing order.
- The third row leaves are two distinct random numbers ranging from 6 to 9.
- The fourth row leaves are 6 distinct random values ranging from 1 to 3.
- The lowest number is always the first leaf in the first row of the table, the greatest number is always the last leaf in the last row of the table, and the mode is always the greatest number in the table found in the last part of the fourth row.
- The answer is formatted as Algebra.

356198

Assistment ID: 356198

[Comment on this question](#)

The following stem and leaf plot shows the number of shoes sold each week at a store. how many different weeks do we have a total count of shoes sold ?

Shoes Sold Each Week

| Stem | Leaf |
|------|------------------------|
| 1 | 2, 2, 3, 4, 5, 6, 6, 8 |
| 2 | 1, 2, 5, 8 |
| 3 | 6, 8 |
| 4 | 2, 2, 3, 3, 3, 3 |

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

- The above problem is a variabilized template.
- The question in the problem body asks for the total count of the number of pieces of data found in the stem and leaf plot.
- The item being sold by the store is variabilized and comes from a set of strings, including: shoes, clothes, sweaters, and glasses.
- The first stem is a random number from 1 to 5, while the other stems are incremented up by 1 for every successive stem below the first.
- The first row leaves are eight distinct random numbers ranging from 1 to 9. The values are always in increasing order.
- The second row leaves are four distinct random values ranging from 1 to 9. The values are always in increasing order.
- The third row leaves are two distinct random numbers ranging from 6 to 9.
- The fourth row leaves are 6 distinct random values ranging from 1 to 3.
- The total count for this assistment is always 20.
- The answer is formatted as Algebra.

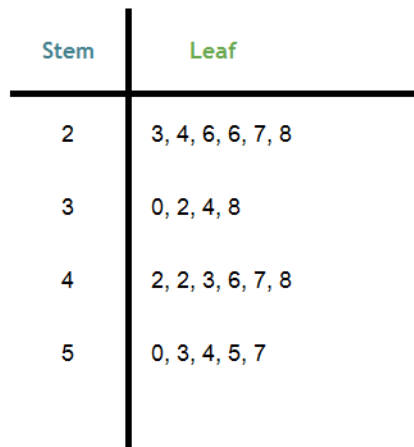
356232

Assistment ID: 356232

[Comment on this question](#)

The following stem and leaf plot shows the number of sweaters sold each week at a store. According to this plot, what is the total number of weeks sweaters were sold?

Sweaters Sold Each Week



Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

- The above problem is a variabilized template.
- The question in the problem body asks for the total number of weeks the selected item was sold, which is directly related to the number of pieces of data found in the stem and leaf plot.
- The item being sold by the store is variabilized and comes from a set of strings, including: shoes, clothes, sweaters, and glasses.
- The first stem is a random number from 1 to 5, while the other stems are incremented up by 1 for every successive stem below the first.
- The first, second, third, and fourth row of leaves are a variable length, which means each row can vary in the number of leaves shown. The rows are composed of seven distinct variables, where each variable is a set of values corresponding to multiple different stem and leaf plots and these variables have the possibility of being blanks. The rows will normally have between 3 and 7 leaves each.
- The leaves range in value from 0 to 9 and the leaf values are always in increasing order.
- This assistment can generate 10 different stem and leaf plots.
- The total number of weeks for the answer ranges between 18 and 27.
- The answer is formatted as Algebra.

357972

Assistment ID: 357972

[Comment on this question](#)

The following stem and leaf plot shows the number of sweaters sold each week at a store. According to this plot, what is the mode of sweaters sold each week?

Sweaters Sold Each Week

| Stem | Leaf |
|------|---------------------|
| 4 | 0, 0, 0, 6, 9, 9 |
| 5 | 2, 3, 4, 4, 5, 6 |
| 6 | 0, 1, 4, 7, 8, 9 |
| 7 | 0, 0, 2, 3, 6, 8, 9 |

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

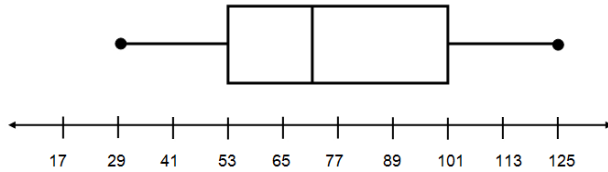
- The above problem is a variabilized template.
- The question in the problem body asks for the mode of the item sold each week that is represented as a stem and leaf plot.
- The item being sold by the store is variabilized and comes from a set of strings, including: shoes, clothes, sweaters, and glasses.
- The first stem is a random number from 1 to 5, while the other stems are incremented up by 1 for every successive stem below the first.
- The first, second, third, and fourth row of leaves are a variable length, which means each row can vary in the number of leaves shown. The rows are composed of seven distinct values, which are produced by a single variable. The single variable each row is a set of values, so each element is the row for a different stem and leaf plot. The rows will normally have between 5 and 7 leaves each.
- The leaves range in value from 0 to 9 and the leaf values are always in increasing order.
- This assistment can generate 10 different stem and leaf plots.
- The mode can appear in any of the four rows of the stem and leaf plot, depending on the stem and leaf plot produced.
- The answer is formatted as Algebra.

355802

Assessment ID: 355802

[Comment on this question](#)

Steve made a box-and-whisker plot on the number of apple pies that he sold per week in a year.



From this plot, what is the value for the sample maximum on the box-and-whisker plot of apple pies sold per week?

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 2

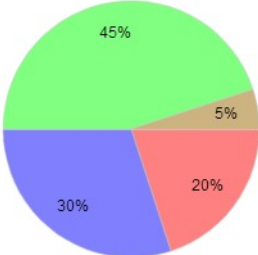
- The above problem is a variabilized template.
- The name that appears in the problem body is one of the names contained within a set of strings, including: Billy, John, Steve, David, Chris, Gary, and Ted.
- The item being sold is one of the items contained within a set of strings, including chocolate bars, apple pies, chocolate chip cookies, and cups of lemonade.
- The question in the problem body asks for one of the following pieces of data found in the box-and-whisker plot: sample minimum, lower quartile, median, upper quartile, and the sample maximum.
- The box-and-whisker plot image is a standard image that does not change with each instance.
- The data values seen on the number line of the box-and-whisker plot are multiplied by a scalefactor, which has the value of 2, 4, or 6.
- The lowest number represented on the number line of the box-and-whisker plot is a random value from 11 to 79.
- The values from left to right on the number line increment by 2 multiplied by the scalefactor for each number. Therefore the incrementation can be 4, 8, or 12.
- The answer is formatted as Algebra.

355780

Assistment ID: 355780 [Comment on this question](#)

A group of students answered a survey. The survey asked the students about what school subject they liked the best. The results are shown in a circle graph below:

Favorite School Subject



| Subject | Percentage |
|---------|------------|
| Science | 45% |
| Math | 30% |
| History | 20% |
| English | 5% |

What category has the greatest percentage?

Type your answer below:

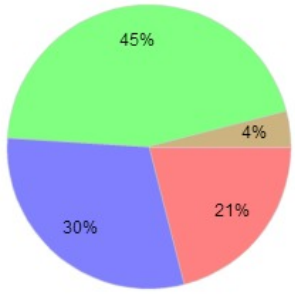
- The above problem is a variabilized template.
- The question in the problem body asks for the category in the circle graph that has the greatest percentage.
- The assistment contains 10 different circle graphs, each with a different topic. Therefore the problem body will change its topic wording depending on what circle graph is produced in the problem body.
- The percentages in each category of the circle graphs will change with each new instance and the number of categories in the circle graph will also change. The number of categories ranges from 4 to 8.
- The category with the greatest percentage will change with each new instance, but it will always be the largest section of the circle graph.
- The answer is formatted as Fill In.

355791

Assistment ID: 355791 [Comment on this question](#)

A group of students answered a survey. The survey asked the students about what their natural hair color was. The results are shown in a circle graph below:

Student Hair Color



| Hair Color | Percentage |
|------------|------------|
| Brown | 45% |
| Blonde | 30% |
| Black | 21% |
| Red | 4% |
| Unlabeled | 4% |

What category has the lowest percentage?

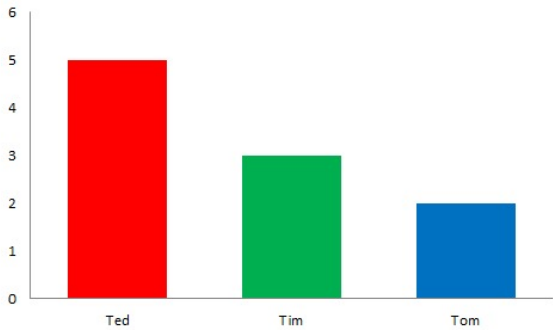
Type your answer below:

- The above problem is a variabilized template.
- The question in the problem body asks for the category in the circle graph that has the lowest percentage.
- The assistment contains 10 different circle graphs, each with a different topic. Therefore the problem body will change its topic wording depending on what circle graph is produced in the problem body.
- The percentages in each category of the circle graphs will change with each new instance and the number of categories in the circle graph will also change. The number of categories ranges from 4 to 8.
- The category with the lowest percentage will change with each new instance, but it will always be the smallest section of the circle graph.
- The answer is formatted as Fill In.

358531 & 358589

Assistment ID: 358531 [Comment on this question](#)

There was a pie eating contest at a local fair that three brothers, Ted, Tim, and Tom, competed against each other in. The number of pies they ate is shown in the bar graph:



| Brother | Pies Eaten |
|---------|------------|
| Ted | 5 |
| Tim | 3 |
| Tom | 2 |

Who won the contest?

Select one:

☒ Tom

☐ It was a tie

☐ Ted

☐ Tim

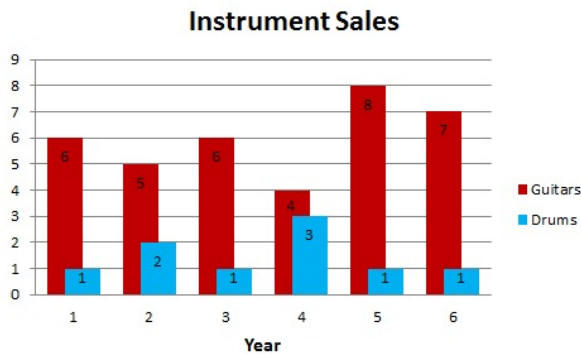
- This is a variabilized template.
- The student is asked about the results of a contest.
- Image is a variabilized image of seven possible images.
- The setup is the same, but there are a set of brother and sisters, variabilized with the images, as well as the answers.
- 358531 asks for the winner, 358589 asks for the loser
- The question is formatted as a Multiple Choice.

358601

Assistment ID: 358601

[Comment on this question](#)

A young musician, Manny, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many guitars did he sell in the 1st year?

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

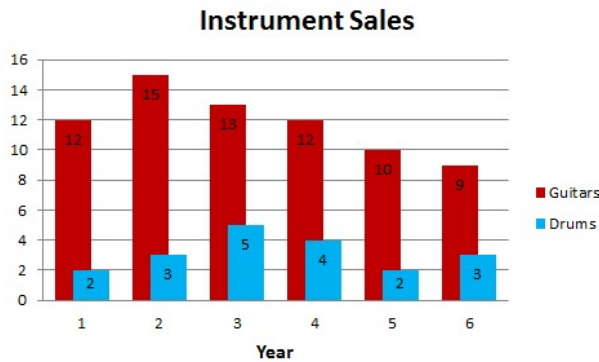
- This is a variabilized template.
- The student is asked to look at sales figures on a bar graph.
- The image is variabilized with five possible images.
- The set-up is the same, but the owner's name and the instrument and year in question change with the image.
- The answer is formatted as Algebra.

361959

Assistment ID: 361959

[Comment on this question](#)

A young musician, Alexandria, decided to open her own music store to sell instruments and teach lessons. She plotted the first six years sales of her highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many more guitars than drum sets did she sell in the 4th year?

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

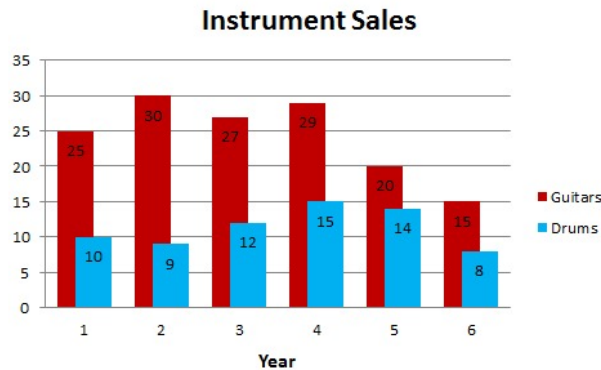
- This is a variabilized template.
- The student is asked to look at sales figures on a bar graph.
- The image is variabilized with five possible images.
- The set-up is the same, but the owner's name and the year in question changes with the image.
- The answer is formatted as Algebra.

361960

Assistment ID: 361960

[Comment on this question](#)

A young musician, Allen, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



Type in the number of the year he sold the greatest number of drum sets.

Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

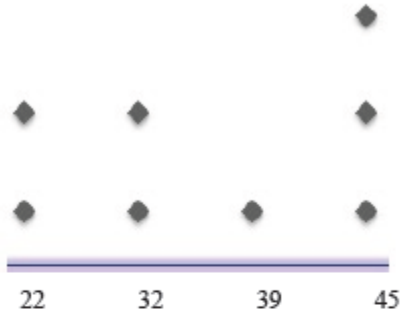
- This is a variabilized template.
- The student is asked to look at sales figures on a Bar Graph.
- The image is variabilized with five possible images.
- The set-up is the same, but the owner's name and the instrument in question change with the image.
- The answer is formatted as Algebra.

Appendix A.2.2: Interpret Data Skill Sample Problem Print

Problem Set "Interpret Data Problem Set - sample assistments" id:[154602]

1) Assistentment #373294 "373294 - 57508 - Mode of Line Plots (Algebra - 4 values) T2"

The line plot below represents the number of customers at eight book stores. Determine the mode.



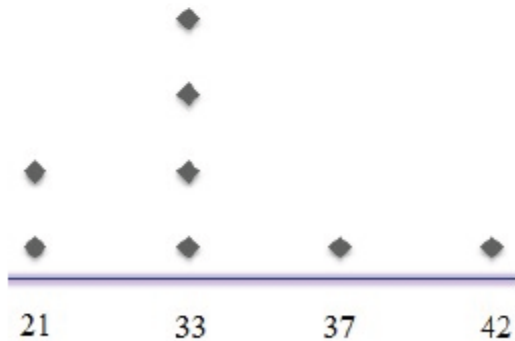
Algebra:

✓ 45

Hints:

- The **mode** is the number that occurs **most frequently** in a set of numbers.
- On a line plot, the **mode** will have the **highest stack** of data marks.

An example is demonstrated below.



From this example plot, you can see that the **highest stack** of marks is at **33**. There are **more marks** at **33** than in any other place. So **33** is the **mode**.

- For the given problem, the mode is **45**.

Type **45**

2) Assistent #373298 "373298 - Race Table"

A few runners participated in a race and their times are listed below:

| Race Participants | Time of Race (in minutes) |
|-------------------|---------------------------|
| Matt | 5.93 |
| Fred | 5.6 |
| Cassie | 5.43 |
| Mary | 5.09 |
| Todd | 5.73 |
| Marcus | 5.2 |
| Rachel | 5.45 |

Who finished the race with the fastest time?

The fastest time is the smallest number of minutes in the table.

Fill in:

✓ Mary

✓ mary

Hints:

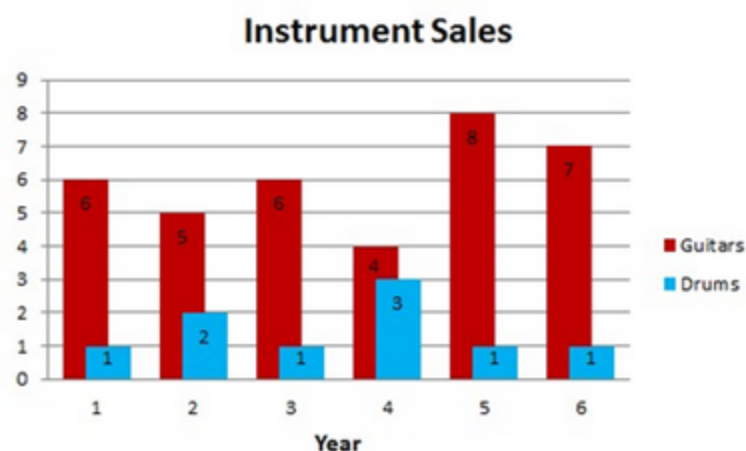
- Find the smallest number in the Time of Race (in minutes) column.
- Look to the left of the number to see which racer had the fastest time.

The racer with the fastest time was Mary.

Type in Mary.

3) Assistent #373302 "373302 - Instrument sales - greatest"

A young musician, Allen, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



Type in the number of the year he sold the greatest number of drum sets.

Algebra:

✓ 4

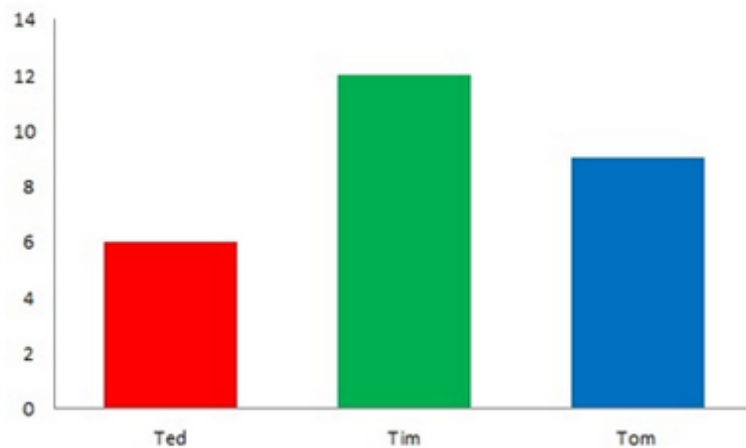
Hints:

- The question is asking about drum sets, so the columns you're focusing on are the blue bars.
- The taller the bar, the more instruments were sold that year. The tallest bar is the year that sold the most drum sets.
- The tallest bar was over year 4, so the most drum sets were sold that year.

Type in 4.

4) Assistent #373306 "373306 - Bar Graphs-Lost Pies-With Numbers"

There was a pie eating contest at a local fair that three brothers, Ted, Tim, and Tom, competed against each other in. The number of pies they ate is shown in the bar graph:



Who lost the contest?

Multiple choice:

- ☒ Ted
- ☐ Tim
- ☐ Tom

Hints:

- The person who ate the fewest pies lost the contest.
- The smallest bar will be the fewest pies eaten.
- The smallest bar was over Ted, so Ted ate the fewest pies and lost the contest.

Choose Ted.

5) Assistent #373309 "373309 - Message Table"

A group of friends made a table of how many emails and text messages they had received the day before. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 18 | 18 |
| Emily | 11 | 16 |
| Francisco | 18 | 20 |
| Stephanie | 19 | 24 |
| Ashley | 18 | 20 |

Who received the most text messages?

Fill in:

- ☒ Stephanie
- ☒ stephanie

Hints:

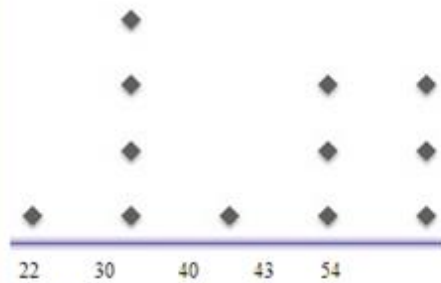
- Type your answer in carefully.
- Find the column for the # of Text Messages and figure out which number is the largest.
- Look to the left of the number to see which friend received the most text messages.

The friend who received the most text messages was Stephanie.

Type in Stephanie.

6) Assistentment #373313 "373313 - 57508 - Mode of Line Plots (Algebra - 5 values) T2"

The line plot below represents the number of purchases at twelve toy shops. Determine the mode.



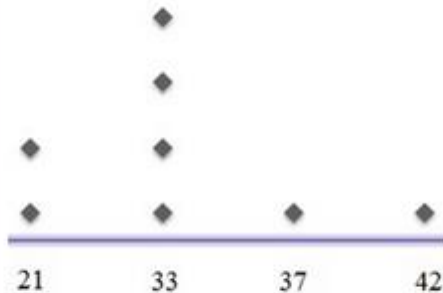
Algebra:

✓ 30

Hints:

- The **mode** is the number that occurs **most frequently** in a set of numbers.
- On a line plot, the **mode** will have the **highest stack** of data marks.

An example is demonstrated below.



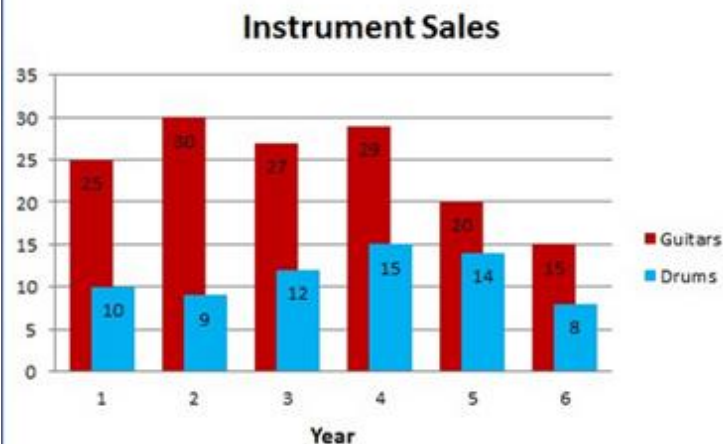
From this example plot, you can see that the **highest stack** of marks is at **33**. There are **more marks** at **33** than in any other place. So **33** is the **mode**.

- For the given problem, the mode is **30**.

Type **30**

7) Assistentment #373317 "373317 - Instrument sales per year - Value"

A young musician, Todd, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many drum sets did he sell in the 6th year?

Algebra:

✓ 8

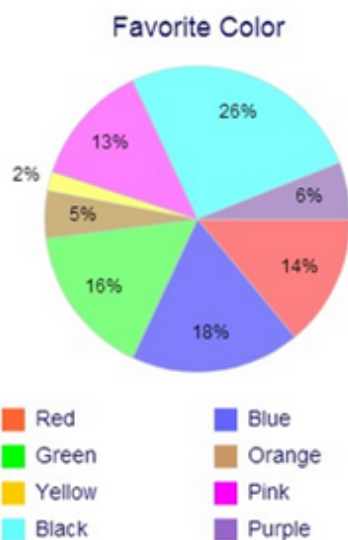
Hints:

- The question is asking about drum sets, so the columns you're focusing on are the blue bars.
- Find the column corresponding to the 6th year and find the value of the blue bar.
- The number of drum sets he sold in the 6th was 8.

Type in 8.

8) Assistent #373321 "373321 - Circle Graph"

A group of students answered a survey. The survey asked the students about what their favorite color was. The results are shown in a circle graph below:



What category has the lowest percentage?

Fill in:

✓ Yellow

✓ yellow

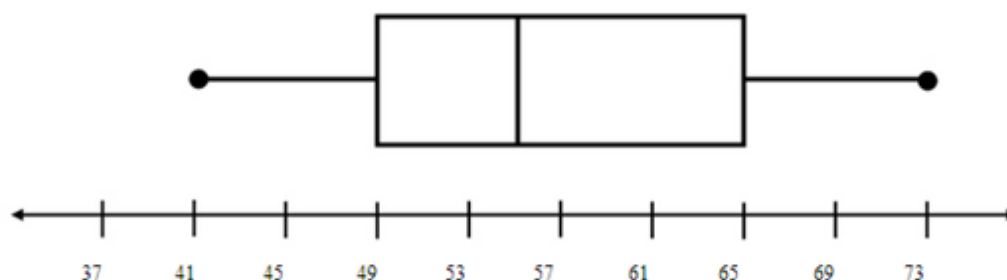
Hints:

- The lowest percentage is the smallest section of the circle graph or the smallest percentage. Therefore the answer is Yellow.

Type in Yellow.

9) Assistent #373329 "373329 - Box and Whisker"

Gary made a box-and-whisker plot on the number of cups of lemonade that he sold per week in a year.



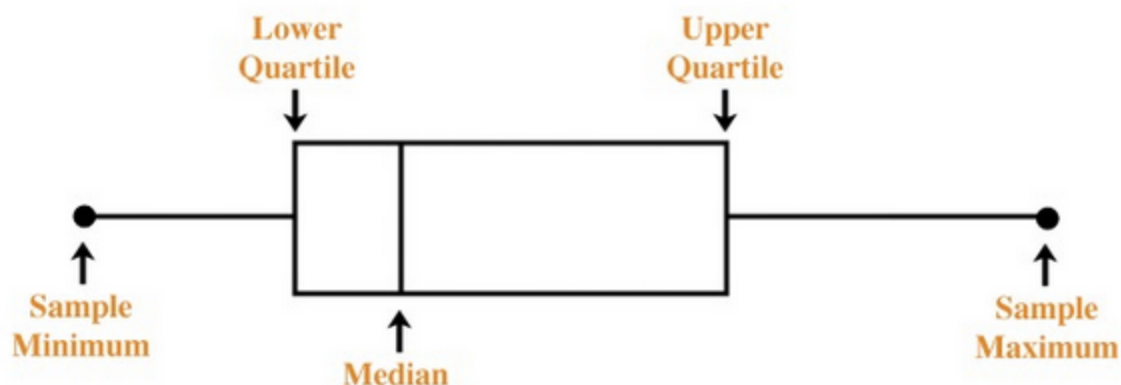
From this plot, what is the value for the sample minimum on the box-and-whisker plot of cups of lemonade sold per week?

Algebra:

✓ 41

Hints:

- Here are the definitions for a box-and-whisker plot:



- The value of the sample minimum represented in the box-and-whisker plot is 41. Type in 41.

10) Assistment #373345 "373345 - Message Table"

A group of friends made a table of how many emails and text messages they had received on Monday of last week. The results can be seen in the table below:

| Friends' Names | # Text Messages | # Emails |
|----------------|-----------------|----------|
| Jared | 6 | 0 |
| Emily | 6 | 25 |
| Francisco | 24 | 4 |
| Stephanie | 34 | 26 |
| Ashley | 10 | 22 |

Who received the most emails?

Fill in:

✓ Stephanie

✓ stephanie

Hints:

- Type your answer in carefully.
- Find the column for the # of Emails and figure out which number is the largest.
- Look to the left of the number to see which friend received the most emails. The friend who received the most emails was Stephanie. Type in Stephanie.

11) Assisment #373349 "373349 - Stem and Leaf - Count"

The following stem and leaf plot shows the number of shoes sold each week at a store. how many different weeks do we have a total count of shoes sold ?

Shoes Sold Each Week

| Stem | Leaf |
|------|------------------------|
| 4 | 1, 1, 2, 4, 5, 5, 5, 7 |
| 5 | 2, 3, 5, 7 |
| 6 | 6, 7 |
| 7 | 2, 2, 3, 3, 3, 3 |

Algebra:

✓ 20

Hints:

- The **stem** is the **tens digit** and the **leaf** is the **ones digit**.

| | 71 | |
|------|----|-------|
| Stem | | Leaf |
| 1 | | 1 3 |
| 2 | | 0 7 7 |
| | | |

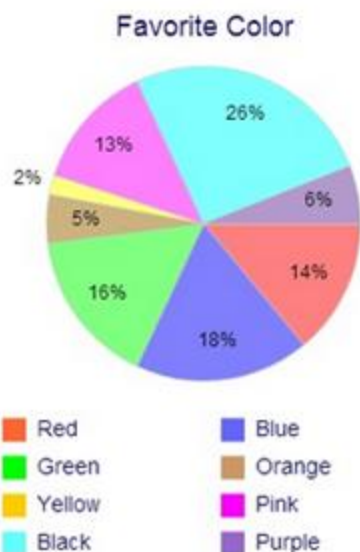
Therefore if you had **32**, the **stem** would be **3** and the **leaf** would be **2**.

- In order to figure out the total number of weeks which shoes were sold, you can count how many individual leaves exist in the stem and leaf plot.
- After counting all of the leaves in the stem and leaf plot above, we can see that the total number of weeks which shoes were sold was 20.

Type in 20.

12) Assistent #373354 "373354 - Circle Graph"

A group of students answered a survey. The survey asked the students about what their favorite color was. The results are shown in a circle graph below:



What category has the greatest percentage?

Fill in:

✓ Black

✓ black

Hints:

- The greatest percentage is the largest section of the circle graph or the largest percentage. Therefore the answer is Black.

Type in Black.

13) Assistent #373362 "373362 - Stem and Leaf - Count"

The following stem and leaf plot shows the number of glasses sold each week at a store. According to this plot, what is the total number of weeks glasses were sold?

Glasses Sold Each Week

| Stem | Leaf |
|------|---------------|
| 2 | 3, 4, 4, 5, 9 |
| 3 | 0, 3, 3, 3, 6 |
| 4 | 0, 1, 2, 4 |
| 5 | 0, 0, 1, 2, 3 |

Algebra:

✓ 19

Hints:

- The **stem** is the **tens digit** and the **leaf** is the **ones digit**.

11

| Stem | Leaf |
|------|------|
| | |
| | |
| | |
| | |

Therefore if you had **32**, the **stem** would be 3 and the **leaf** would be 2.

- Each number in the Leaf side shows a week that was recorded in the plot.
- After counting all of the leaves in the stem and leaf plot above, we can see that the total number of weeks which glasses were counted and recorded was 19.

Type in 19.

14) Assistentment #373367 "373367 - Stem and Leaf - Mode"

The following stem and leaf plot shows the number of shoes sold each week at a store. According to this plot, what is the greatest number of shoes sold in a week?

Shoes Sold Each Week

| Stem | Leaf |
|------|------------------------|
| 1 | 1, 1, 2, 3, 4, 5, 5, 9 |
| 2 | 1, 2, 5, 9 |
| 3 | 6, 9 |
| 4 | 1, 1, 2, 2, 2, 2 |

Algebra:

✓ 42

Hints:

- The **stem** is the **tens digit** and the **leaf** is the **ones digit**.

11

| Stem | Leaf |
|------|------|
| | |
| | |
| | |
| | |

Therefore if you had 25, the stem would be 2 and the leaf would be 5.

- {The greatest number is the last number found in the stem and leaf plot.
- From the stem and leaf plot above, we can see that the greatest number is 42.
Type in 42.

15) Assisment #373371 "373371 - 57508 - Mode of Line Plots (Algebra - 5 values) T1"

The line plot below represents the number of customers at twelve pharmacies. Determine the mode.



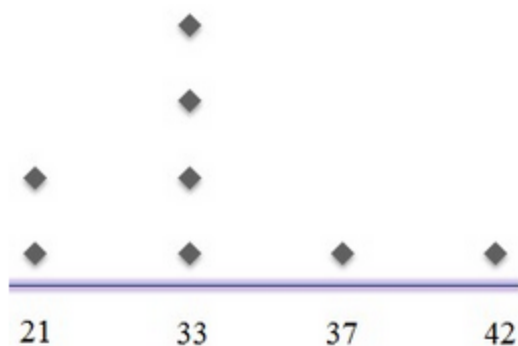
Algebra:

✓ 45

Hints:

- The mode is the number that occurs most frequently in a set of numbers.
- On a line plot, the mode will have the highest stack of data marks.

An example is demonstrated below.



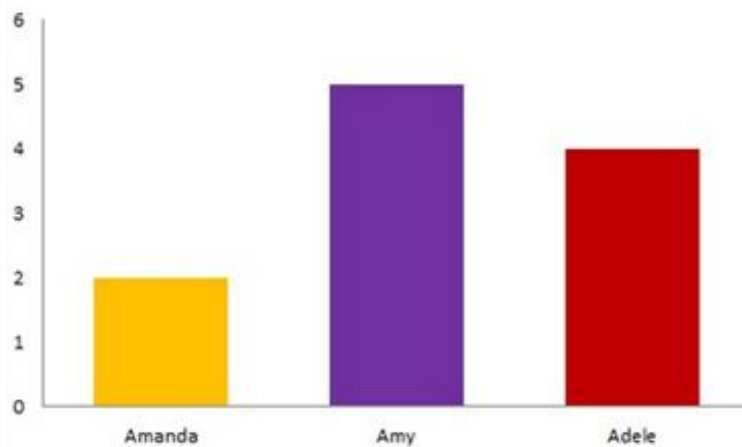
From this example plot, you can see that the highest stack of marks is at 33. There are more marks at 33 than in any other place. So 33 is the mode.

- For the given problem, the mode is 45.

Type 45

16) Assistentment #373375 "373375 - Bar Graphs-Won Pies-With Numbers"

There was a pie eating contest at a local fair that three sisters, Amanda, Amy, and Adele, competed against each other in. The number of pies they ate is shown in the bar graph:



Who won the contest?

Multiple choice:

- ☒ Amy
- ☐ Adele
- ☐ Amanda
- ☐ It was a tie

Hints:

- The person who ate the most pies won the contest.
- The taller the bar, the more pies that person ate. So the tallest bar won.
- The tallest bar was over Amy, so Amy ate the most pies and won the contest.

Choose Amy.

17) Assistentment #373378 "373378 - Date Temperatures"

The chart below shows temperatures, in degrees Fahrenheit, for a seven-day period in December.

| Date | Temperature |
|-------------|-------------|
| December 22 | 24°F |
| December 23 | 28°F |
| December 24 | 21°F |
| December 25 | 16°F |
| December 26 | 33°F |
| December 27 | 19°F |
| December 28 | 12°F |

On what date was the temperature the hottest? Remember Months are capitalized.

Fill in:

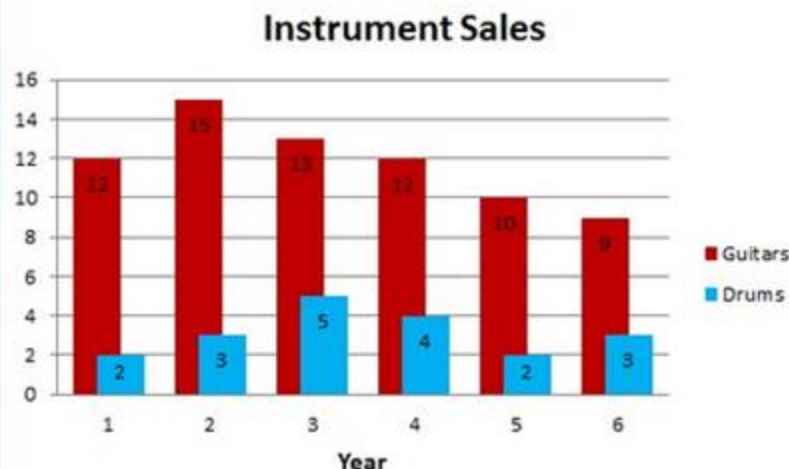
- ☒ December 26
- ☒ December26

Hints:

- Find the highest temperature in the Temperature column.
- Look to the left of the highest temperature in order to figure out the date on which it occurred.
Type in December 26

18) Assisment #373382 "373382 - Insturment sales - differences"

A young musician, Gloria, decided to open her own music store to sell instruments and teach lessons. She plotted the first six years sales of her highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many more guitars than drum sets did she sell in the 2nd year?

Algebra:

✓ 12

Hints:

- She sold 15 guitars and 3 drum sets in the 2nd year.
- There are more guitars than drum sets, so subtract.

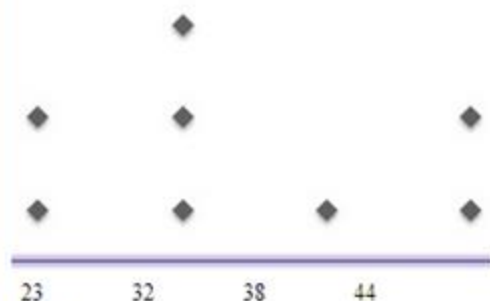
15 - 3

- There are 12 more guitars than drum sets.

Type in 12.

19) Assisment #373385 "373385 - 57508 - Mode of Line Plots (Algebra - 4 values) T1"

The line plot below represents the number of customers at eight book stores. Determine the mode.

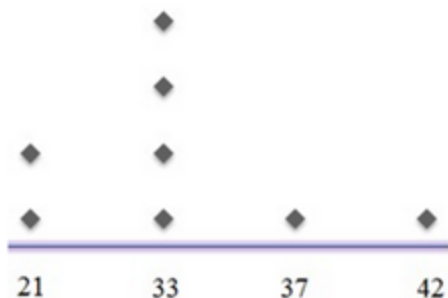


Algebra:

✓ 32

Hints:

- The **mode** is the number that occurs **most frequently** in a set of numbers.
 - On a line plot, the **mode** will have the **highest stack** of data marks.
- An example is demonstrated below.



From this example plot, you can see that the **highest stack** of marks is at **33**. There are **more marks** at **33** than in any other place. So **33** is the **mode**.

- For the given problem, the mode is **32**.

Type **32**

20) Assistentment #373389 "373389 - Stem and Leaf - Count"

The following stem and leaf plot shows the number of shoes sold each week at a store. According to this plot, what is the mode of shoes sold each week?

Shoes Sold Each Week

| Stem | Leaf |
|------|---------------------|
| 3 | 0, 2, 3, 5, 6, 8, 9 |
| 4 | 0, 2, 2, 4, 7, 7, 9 |
| 5 | 1, 4, 5, 7, 8, 9 |
| 6 | 0, 1, 5, 5, 5, 8 |

Algebra:

✓ 65

Hints:

- The **stem** is the **tens digit** and the **leaf** is the **ones digit**.

| 20 | |
|------|------|
| Stem | Leaf |
| 1 | 13 |
| | |
| | |

Therefore if you had **32**, the **stem** would be **3** and the **leaf** would be **2**.

- The mode is the number seen most often in a set of numbers.
- From the stem and leaf plot above, we can see that the mode is **65**.

Type in **65**.

Appendix A.3.1: Interpreting Coordinate Graphs Skill Documentation

| Skill | Common Core State Standard |
|-----------------------------------|----------------------------|
| Interpreting Coordinate Graphs | |

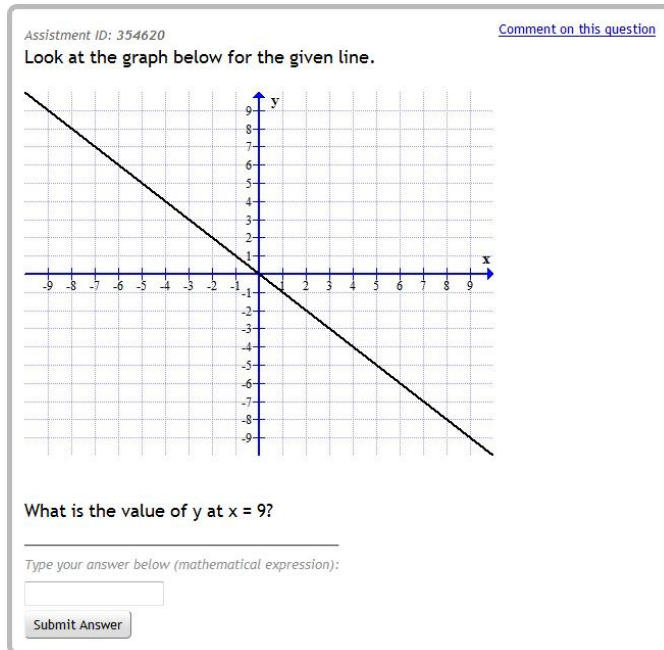
| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 85019 | 15 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

354620 7 instances
 356699 7 instances
 354979 7 instances
 356700 7 instances
 355325 7 instances
 356701 7 instances
 355469 7 instances
 356702 7 instances
 355032 14 instances
 355037 7 instances
 355039 7 instances
 355409 5 instances
 357963 5 instances
 357964 5 instances
 368151 5 instances

Templates:

354620



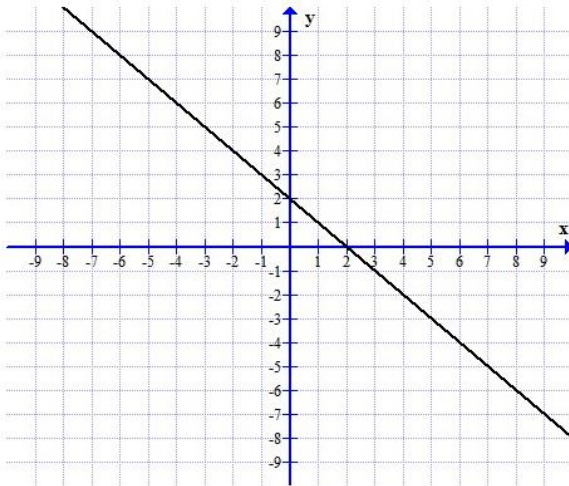
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding y -value for the stated x -value.
- The graph shown in the problem body is a variabilized image of eight possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of either 1 or -1.
- The line can either pass through $y=-2, -1, 0$, or 2.
- The x -value stated in the question is a random integer value from -9 to 9.
- The answer is formatted as Algebra.

356699

Assistment ID: 356699

[Comment on this question](#)

Look at the graph below for the given line.



What is the value of x , when $y = -5$?

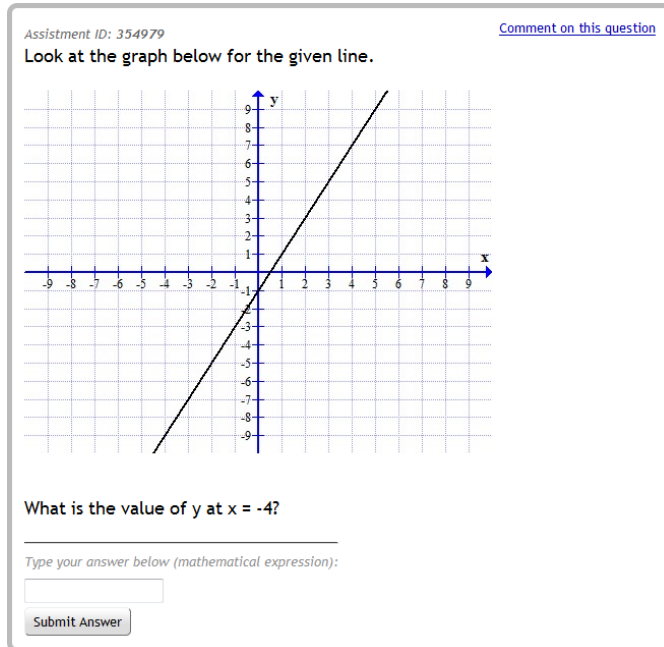
Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 3

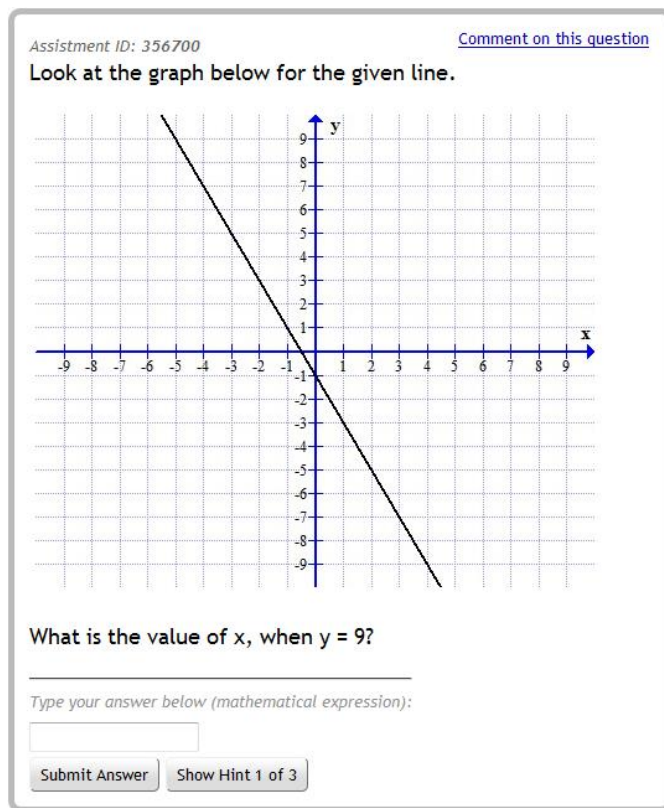
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding x -value for the stated y -value.
- The graph shown in the problem body is a variabilized image of eight possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of either 1 or -1.
- The line can either pass through $y=-2, -1, 0$, or 2.
- The y -value stated in the question is a random integer value, which can range from -9 to 9.
- The answer is formatted as Algebra.

354979



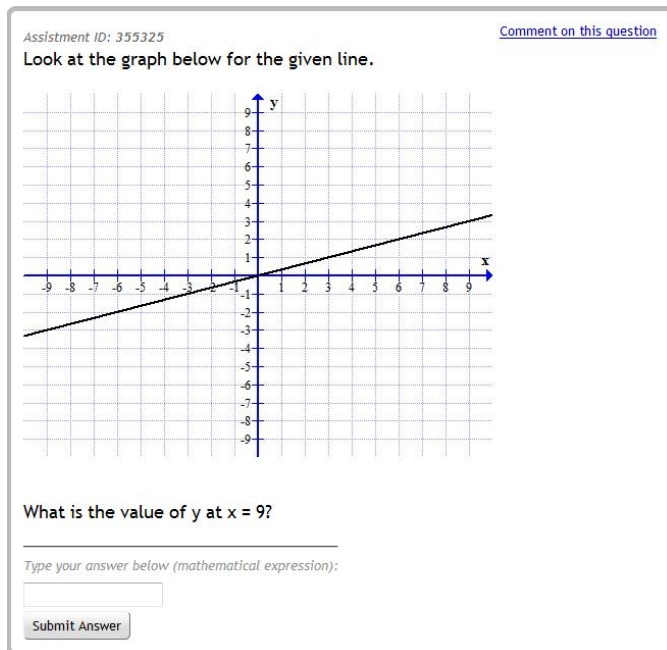
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding y -value for the stated x -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 2, -2, $1/2$, or $-1/2$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The x -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The x -value will only be values which can be easily seen on the coordinate grid in the problem.
- The x -value stated in the question is a random integer value from -9 to 9 for the $1/2$ and $-1/2$ slope lines.
- The answer is formatted as Algebra.

356700



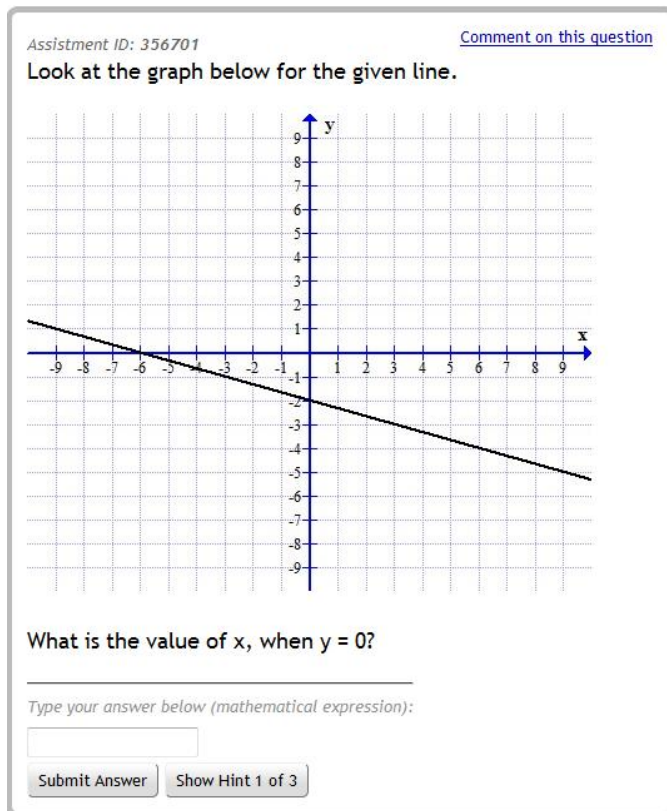
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding x -value for the stated y -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 2, -2, $1/2$, or $-1/2$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The y -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The y -value will only be values which can be easily seen on the coordinate grid in the problem.
- Therefore the x -value answer will also be an integer value that can be easily read using the given image with a line with a slope of 2, -2, $1/2$, or $-1/2$.
- The answer is formatted as Algebra.

355325



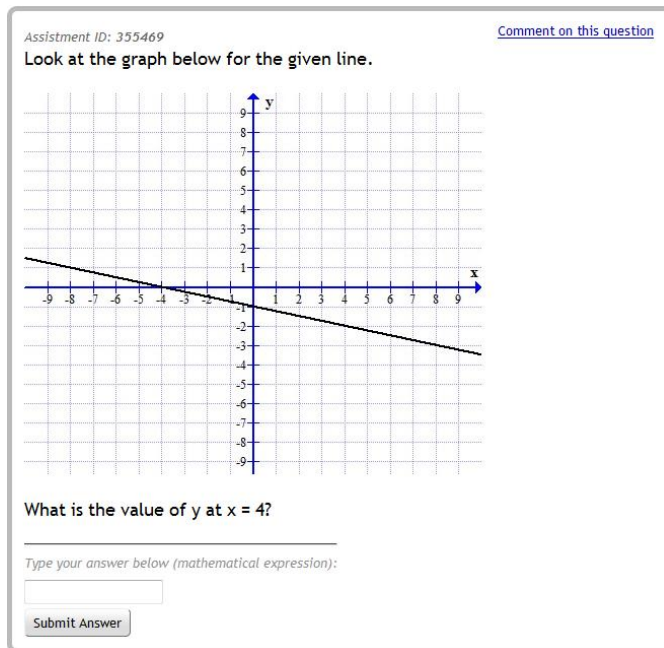
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding y -value for the stated x -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 3, -3, $1/3$, or $-1/3$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The x -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The x -value will only be values which can be easily seen on the coordinate grid in the problem.
- The x -value stated in the question for the $1/3$ and $-1/3$ slope lines are part of a set, which includes: -9, -6, -3, 0, 3, 6, and 9. This allows the answer to be an integer value.
- The answer is formatted as Algebra.

356701



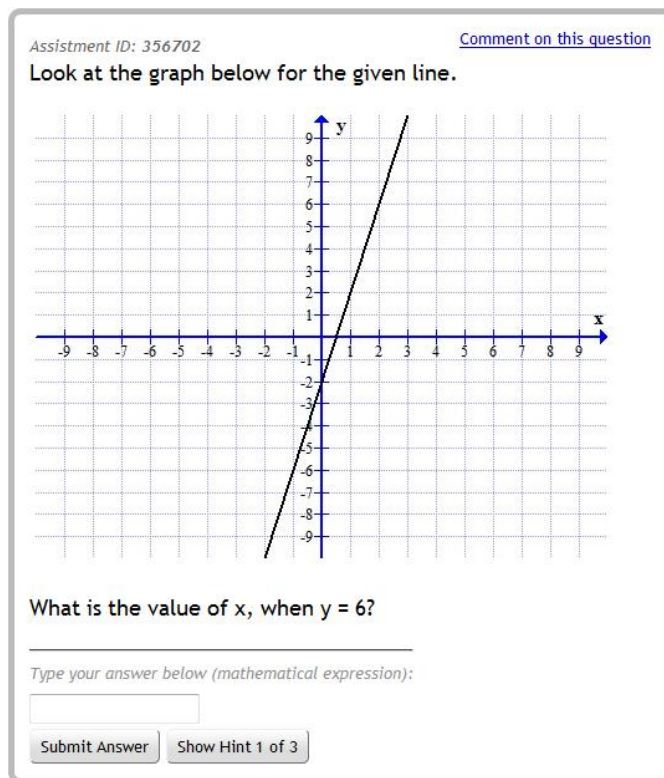
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding x -value for the stated y -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 3, -3, $1/3$, or $-1/3$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The y -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The y -value will only be values which can be easily seen on the coordinate grid in the problem.
- Therefore the x -value answer will also be an integer value that can be easily read using the given image with a line with a slope of 3, -3, $1/3$, or $-1/3$.
- The answer is formatted as Algebra.

355469



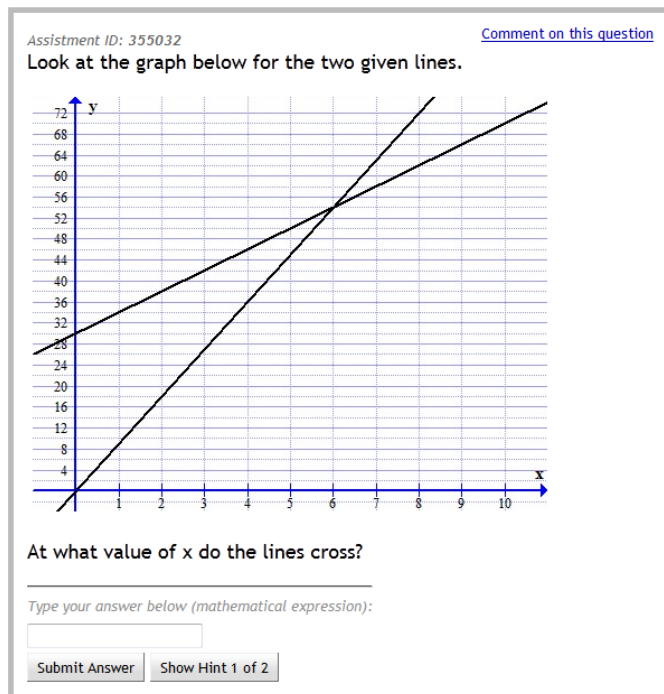
- The above problem is a variabilized template.
- The student is asked to give the proper corresponding y -value for the stated x -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 4, -4, $\frac{1}{4}$, or $-\frac{1}{4}$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The x -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The x -value will only be values which can be easily seen on the coordinate grid in the problem.
- The x -value stated in the question for the $\frac{1}{4}$ and $-\frac{1}{4}$ slope lines are part of a set, which includes: -8, -4, 0, 4, and 8. This allows the answer to be an integer value.
- The answer is formatted as Algebra.

356702



- The above problem is a variabilized template.
- The student is asked to give the proper corresponding x -value for the stated y -value.
- The graph shown in the problem body is a variabilized image of sixteen possible images.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The line produced on the graph always has a slope of 4, -4, $1/4$, or $-1/4$.
- The line can either pass through $y=-2, -1, 0$, or 2 .
- The y -value stated in the question is a random value that ranges in value depending on the equation of the line shown in the problem body. The y -value will only be values which can be easily seen on the coordinate grid in the problem.
- Therefore the x -value answer will also be an integer value that can be easily read using the given image with a line with a slope of 4, -4, $1/4$, or $-1/4$.
- The answer is formatted as Algebra.

355032



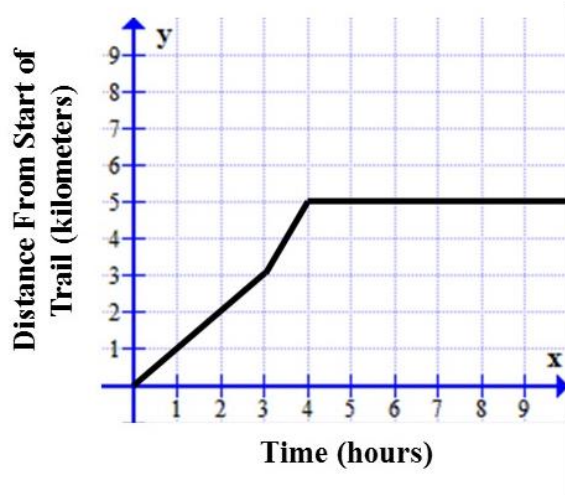
- The above problem is a variabilized template.
- The image in the problem is variabilized and there are 14 possible graph images where the two lines intersect at a specific point.
- This assistment has two main problems, where the first one asks for the x -value of the intersection of the two lines and the second one asks for the y -value of the intersection of the two lines..
- Depending on the main problem the student is working on, the student is asked to give the proper corresponding y -value or x -value.
- The x - y axis coordinate grid shown will have varying y -axis intervals depending on the graph shown.
- The answers to each of the main problems will directly line up with a grid line on the image, but they might not be labeled numbers.
- The answers are formatted as Algebra.

355037

Assessment ID: 355037

[Comment on this question](#)

The graph of a hiker's journey is represented by the line below.



What is the first hour that the hiker is not moving?

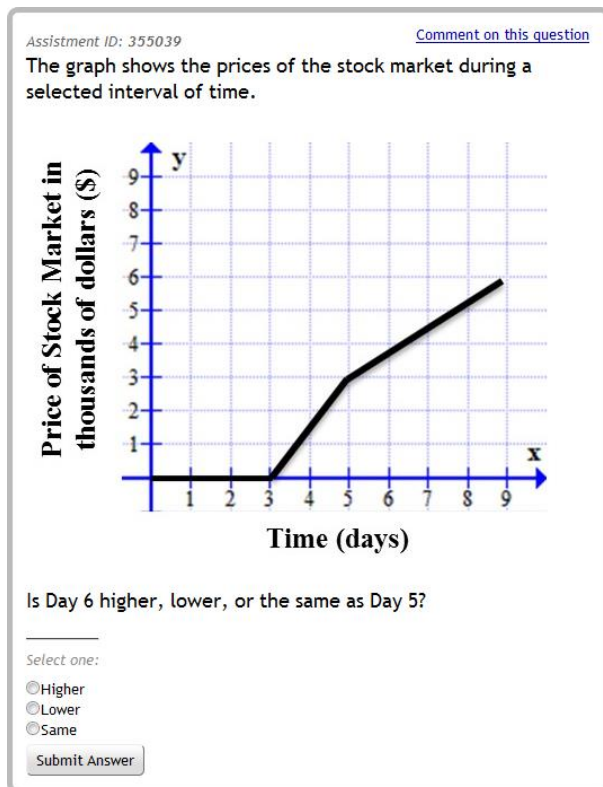
Type your answer below (mathematical expression):

Submit Answer

Show Hint 1 of 2

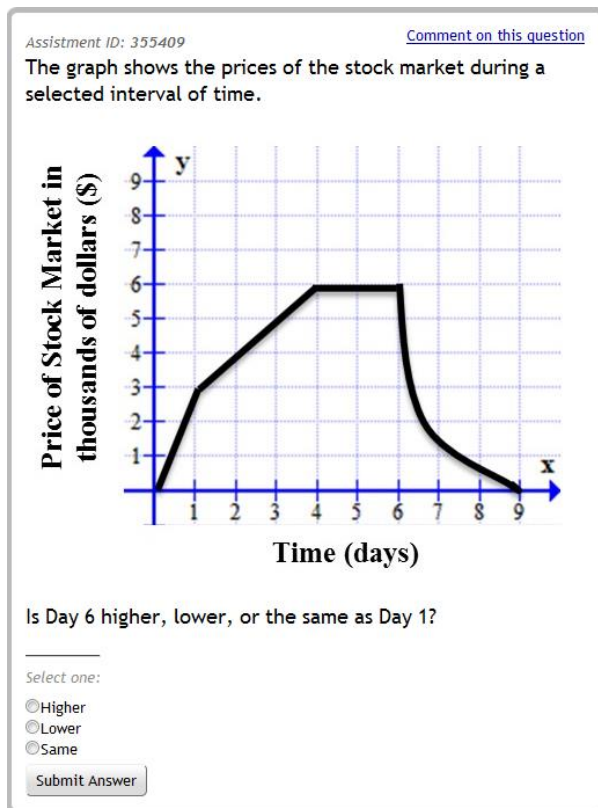
- The above problem is a variabilized template.
- The student is asked to the first hour at which the hiker stops moving, which is where the graph has a slope of 0.
- The graph shown in the problem body is a variabilized image of ten possible images.
- Each graph is a story type graph, which is a single graph created by combining a series of other line equations over different values of x using a piecewise function.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The labels are Distance from the Start of the Trail, measured in kilometers, on the y -axis and Time, measured in hours, on the x -axis.
- The answer to the question is directly related to the graph which is shown in the problem body, so the answers are stored in a set linked to the set which stores the numbers for all of the variabilized images.
- The answer is formatted as Algebra.

355039 & 357963



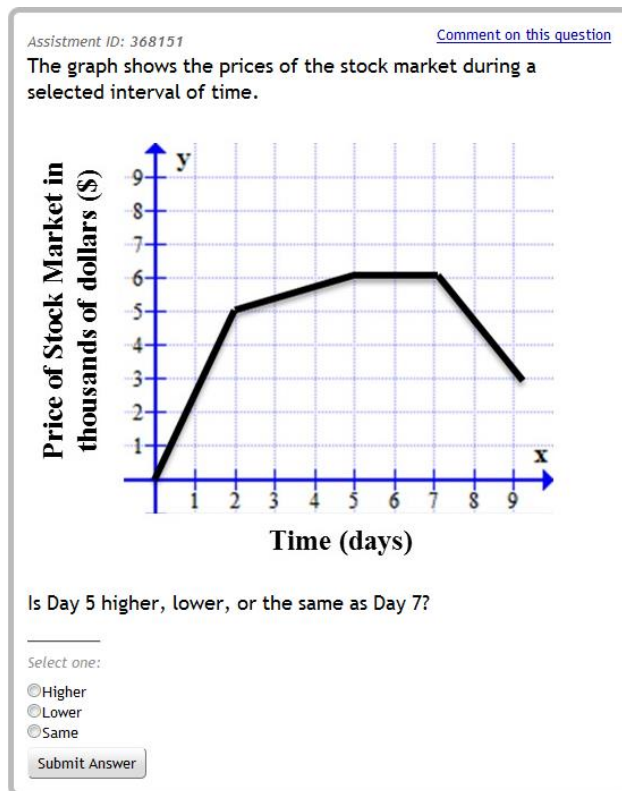
- The above problem is a variabilized template.
- The student is asked compare two y-values of the graph for two different Days to see whether the first Day stated is higher, lower, or the same as the second Day.
- For assistment #355039, the first Day will always be higher than the second Day.
- For assistment #357963, the first Day will always be lower than the second Day.
- The graph shown in the problem body is a variabilized image of 5 possible images.
- Each graph is a story type graph, which is a single graph created by combining a series of other line equations over different values of x using a piecewise function.
- The x-y axis coordinate grid shown in the problem body always looks the same.
- The labels are Price of the Stock Market in thousands of dollars on the y-axis and Time, measured in days, on the x-axis.
- The first Day in the problem body is a set of selected values between 1 and 9 that is directly linked to the set of values for the second Day in the problem body, which also has values between 1 and 9.
- The answer to the question is directly related to the graph which is shown in the problem body, so the answers are stored in a set linked to the set which stores the numbers for all of the variabilized images.
- The answer is formatted as Algebra.

355409 & 357964



- The above problem is a variabilized template.
- The student is asked compare two y-values of the graph for two different Days to see whether the first Day stated is higher, lower, or the same as the second Day.
- For assistment #355409, the first Day will always be higher than the second Day.
- For assistment #357964, the first Day will always be lower than the second Day.
- The graph shown in the problem body is a variabilized image of 5 possible images.
- Each graph is a story type graph, which is a single graph created by combining a series of other line equations over different values of x using a piecewise function.
- The x-y axis coordinate grid shown in the problem body always looks the same.
- The labels are Price of the Stock Market in thousands of dollars on the y-axis and Time, measured in days, on the x-axis.
- The first Day in the problem body is a set of selected values between 1 and 9 that is directly linked to the set of values for the second Day in the problem body, which also has values between 1 and 9.
- The answer to the question is directly related to the graph which is shown in the problem body, so the answers are stored in a set linked to the set which stores the numbers for all of the variabilized images.
- The answer is formatted as Algebra.

368151



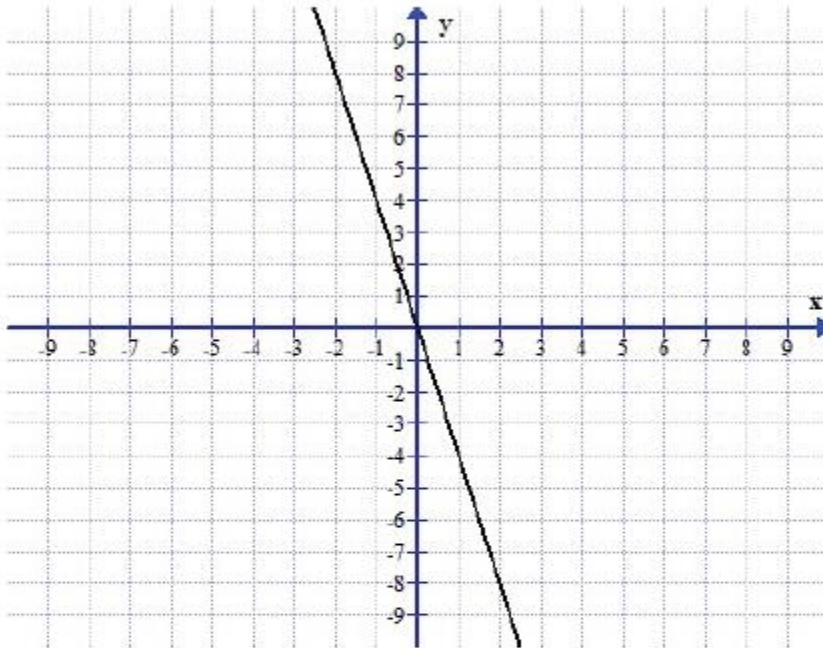
- The above problem is a variabilized template.
- The student is asked compare two y-values of the graph for two different Days to see whether the first Day stated is higher, lower, or the same as the second Day.
- The first Day will always be the same as the second Day.
- The graph shown in the problem body is a variabilized image of 10 possible images.
- Each graph is a story type graph, which is a single graph created by combining a series of other line equations over different values of x using a piecewise function.
- The x - y axis coordinate grid shown in the problem body always looks the same.
- The labels are Price of the Stock Market in thousands of dollars on the y -axis and Time, measured in days, on the x -axis.
- The first Day in the problem body is a set of selected values between 1 and 9 that is directly linked to the set of values for the second Day in the problem body, which also has values between 1 and 9.
- The answer to the question is directly related to the graph which is shown in the problem body, so the answers are stored in a set linked to the set which stores the numbers for all of the variabilized images.
- The answer is formatted as Algebra.

Appendix A.3.2: Interpreting Coordinate Graphs Skill Sample Problem Print

Problem Set "Interpreting Coordinate Graphs Skill - sample assistments" id[154672]

1) Assistent #373404 "373404 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of x , when $y = 8$?

Algebra:

✓ -2

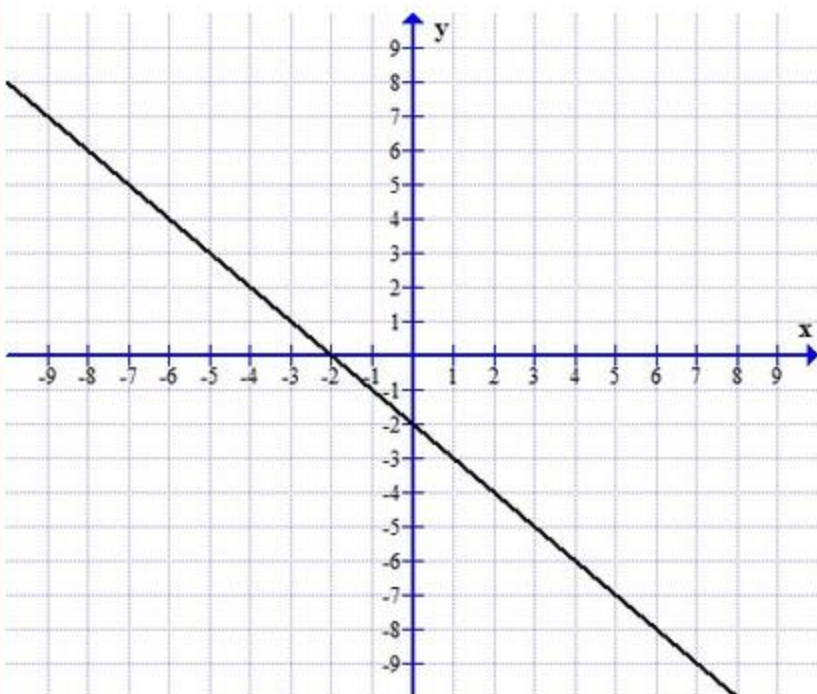
Hints:

- Find $y = 8$ on the y -axis.
- Now move to the left or right until you reach the line. Then look to see the value of x at that point.
- Move up or down and you will see that $x = -2$.

Type in -2.

2) Assistentment #373434 "373434 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of y at $x = 7$?

Algebra:

✓ -9

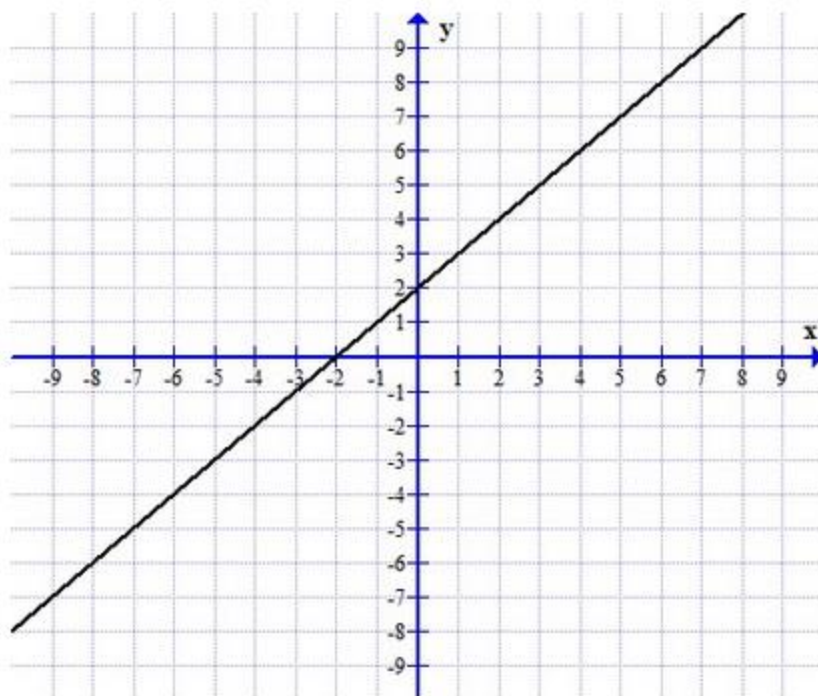
Hints:

- Find $x = 7$ on the x -axis and move up or down to find the line.
- When you move left or right from the line over to the y -axis you will see that $y = -9$.

Type in -9.

3) Assistentment #373441 "373441 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of x , when $y = 3$?

Algebra:

✓ 2

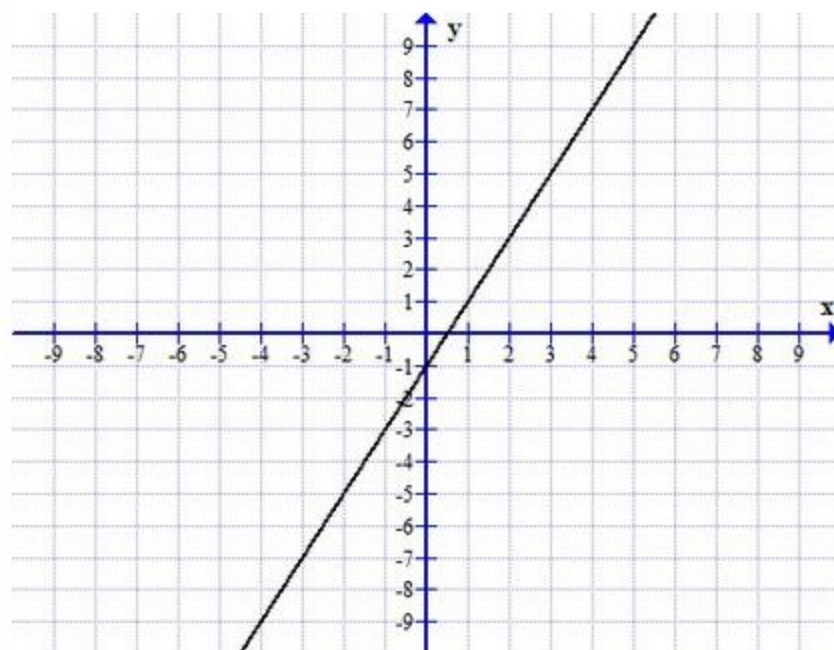
Hints:

- Find $y = 3$ on the y -axis.
- Now move to the left or right until you reach the line. Then look to see the value of x at that point.
- Move up or down and you will see that $x = 2$.

Type in 2.

4) Assistentment #373474 "373474 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of y at $x = 1$?

Algebra:

✓ 1

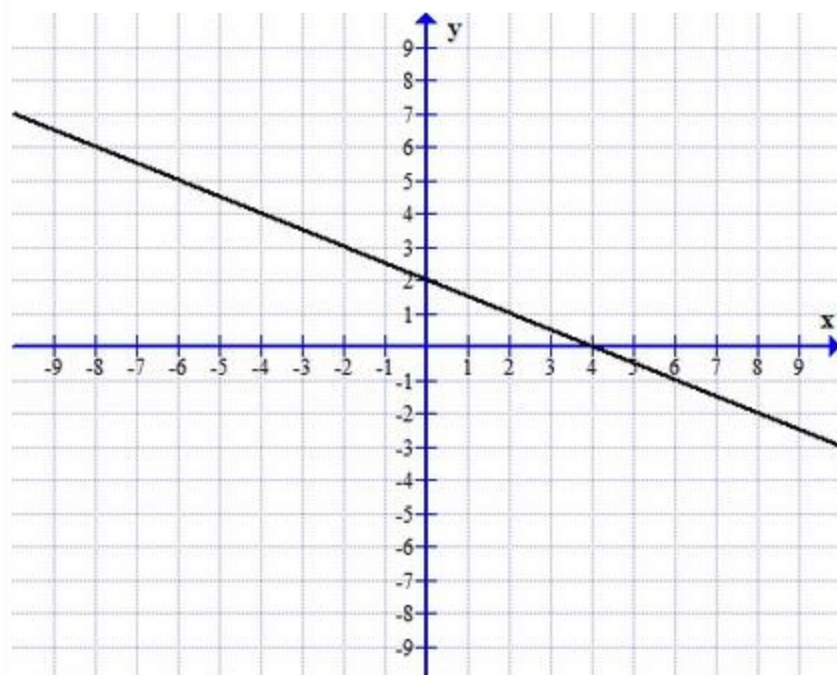
Hints:

- Find $x = 1$ on the x -axis and move up or down to find the line.
- When you move left or right from the line over to the y -axis you will see that $y = 1$.

Type in 1.

5) Assistentment #373455 "373455 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of x , when $y = 0$?

Algebra:

✓ 4

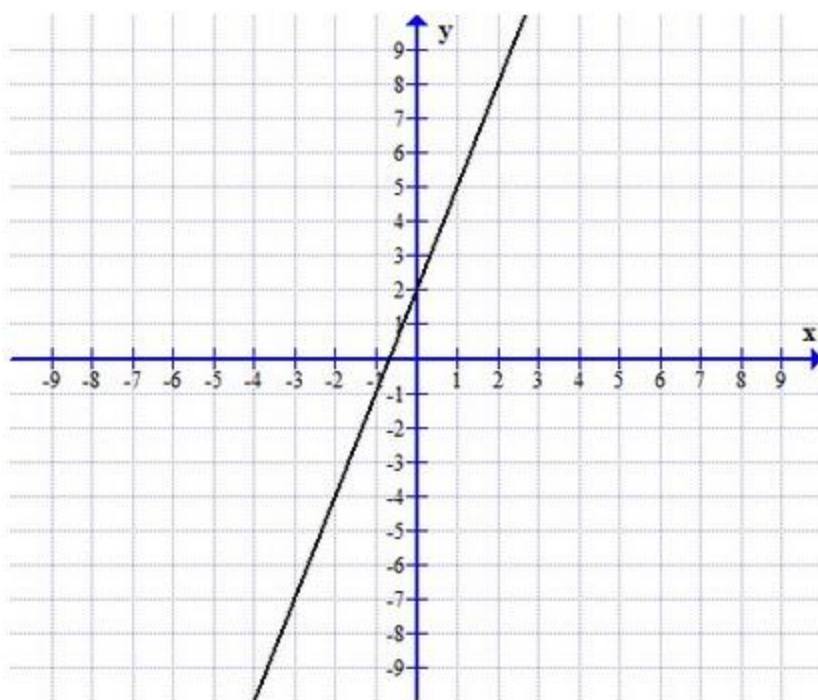
Hints:

- Find $y = 0$ on the y -axis.
- Now move to the left or right until you reach the line. Then look to see the value of x at that point.
- Move up or down and you will see that $x = 4$.

Type in 4.

6) Assisment #373448 "373448 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of y at $x = -1$?

Algebra:

✓ -1

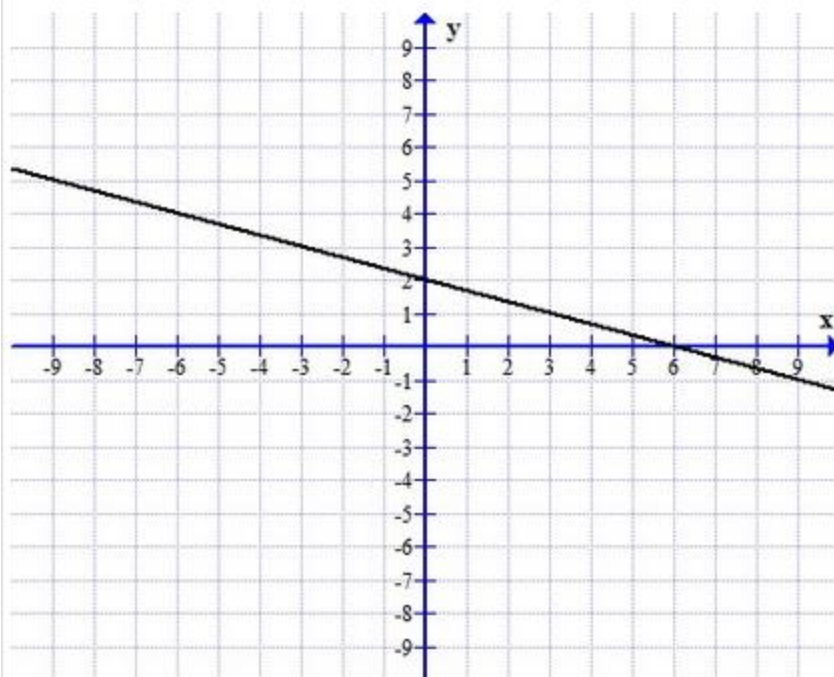
Hints:

- Find $x = -1$ on the x -axis and move up or down to find the line.
- When you move left or right from the line over to the y -axis you will see that $y = -1$.

Type in -1.

7) Assistentment #373488 "373488 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of x , when $y = 4$?

Algebra:

✓ -6

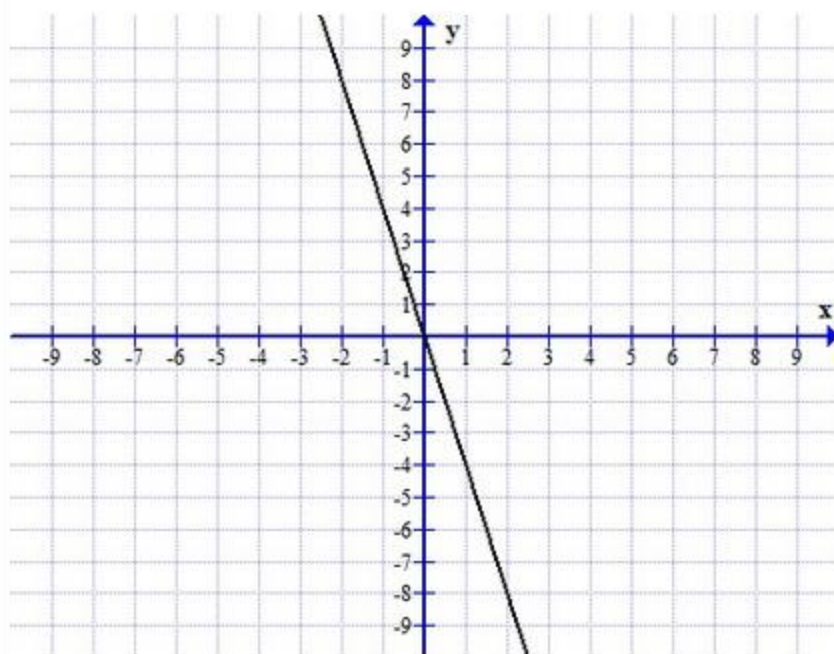
Hints:

- Find $y = 4$ on the y -axis.
- Now move to the left or right until you reach the line. Then look to see the value of x at that point.
- Move up or down and you will see that $x = -6$.

Type in -6.

8) Assisment #373481 "373481 - Interpreting Coordinate Graphs"

Look at the graph below for the given line.



What is the value of y at $x = 0$?

Algebra:

✓ 0

Hints:

- Find $x = 0$ on the x -axis and move up or down to find the line.
- When you move left or right from the line over to the y -axis you will see that $y = 0$.

Type in 0.

9) Assignment #385330 "385330 - Interpreting Coordinate Graphs"

A) Look at the graph below for the two given lines.



At what value of x do the lines cross?

Algebra:

✓ 7

Hints:

- Locate the intersection of the two lines and look below to see the value of x at which the lines cross.
- The lines cross at $x = 7$.

Type in 7

B) What is the value of y at which the lines cross?



Algebra:

✓ 54

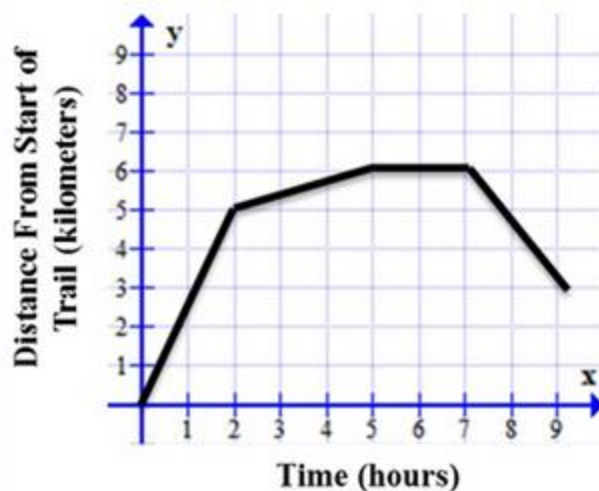
Hints:

- Locate the intersection of the two lines and look to the left to see the value of y at which the lines cross.
- The lines cross at $y = 54$.

Type in 54

10) Assisment #373417 "373417 - Interpreting Coordinate Graphs"

The graph of a hiker's journey is represented by the line below.



What is the first hour that the hiker is not moving?

Algebra:

✓ 5

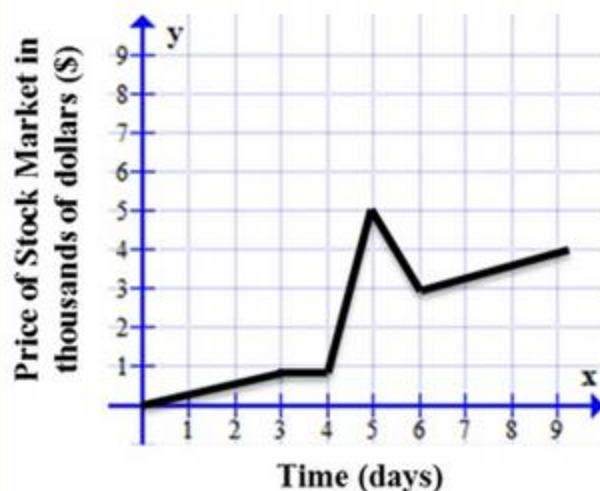
Hints:

- The hiker is not moving when the line stays flat and the value is held constant.
- The first time this happens is at hour 5.

Type in 5

11) Assisment #373462 "373462 - Interpreting Coordinate Graphs"

The graph shows the prices of the stock market during a selected interval of time.



Is Day 8 higher, lower, or the same as Day 3?

Multiple choice:

✓ Higher

✗ Lower

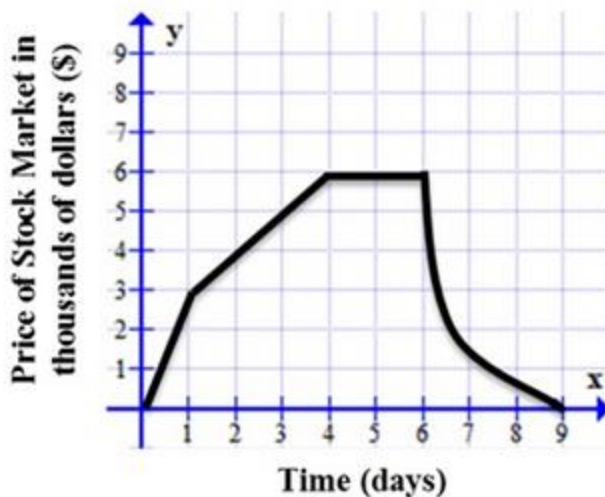
• Place your fingers on each value, which finger is higher?

✗ Same

• Place your fingers on each value, which finger is higher?

12) Assistent #373493 "373493 - Interpreting Coordinate Graphs"

The graph shows the prices of the stock market during a selected interval of time.



Is Day 5 higher, lower, or the same as Day 2?

Multiple choice:

☒ Higher

☐ Lower

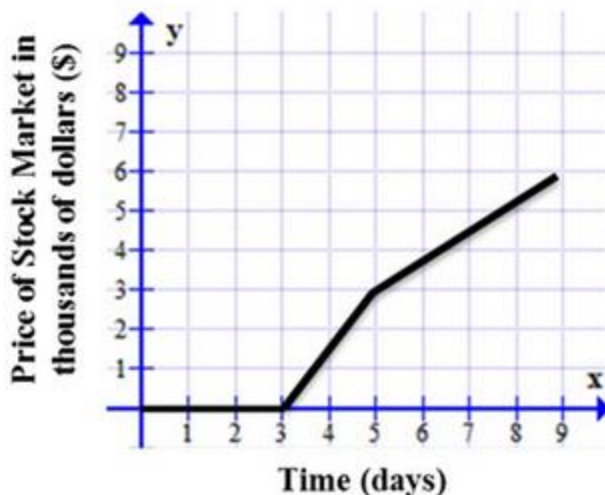
• Place your fingers on each value, which finger is higher?

☐ Same

• Place your fingers on each value, which finger is higher?

13) Assistent #373422 "373422 - Interpreting Coordinate Graphs"

The graph shows the prices of the stock market during a selected interval of time.



Is Day 3 higher, lower, or the same as Day 9?

Multiple choice:

☐ Higher

• Place your fingers on each value, which finger is higher?

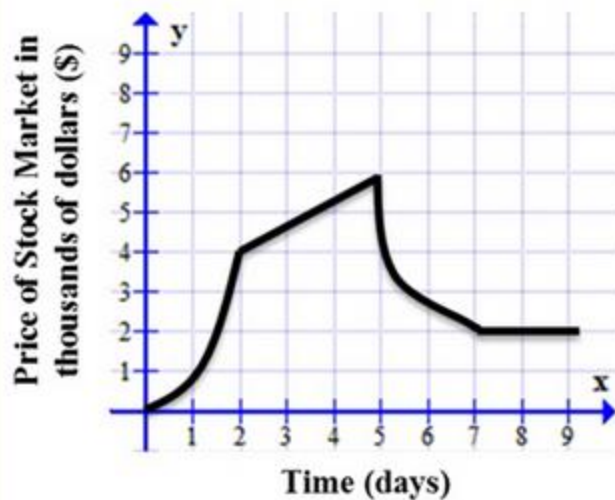
☒ Lower

☐ Same

• Place your fingers on each value, which finger is higher?

14) Assistent #373427 "373427 - Interpreting Coordinate Graphs"

The graph shows the prices of the stock market during a selected interval of time.



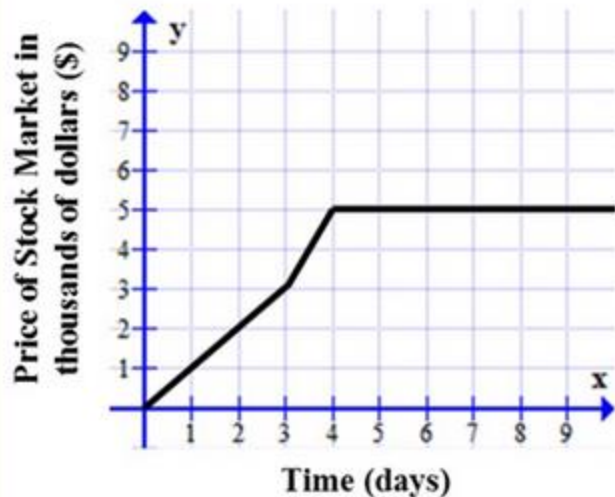
Is Day 1 higher, lower, or the same as Day 5?

Multiple choice:

- ☒ Higher
 - Place your fingers on each value, which finger is higher?
- ☒ Lower
- ☒ Same
 - Place your fingers on each value, which finger is higher?

15) Assistent #373467 "373467 - Interpreting Coordinate Graphs"

The graph shows the prices of the stock market during a selected interval of time.



Is Day 6 higher, lower, or the same as Day 7?

Multiple choice:

- ☒ Higher
 - Place your fingers on each value. Is one finger higher than the other?
- ☒ Lower
 - Place your fingers on each value. Is one finger lower than the other?
- ☒ Same

Appendix A.4.1: Similar Figures Skill Documentation

| Skill | Common Core State Standard |
|-----------------|----------------------------|
| Similar Figures | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 96850 | 14 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

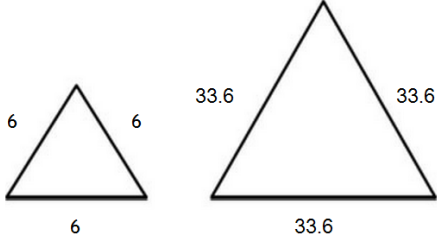
Assistment Templates:

| | |
|--------|--------------|
| 382778 | 10 instances |
| 379806 | 10 instances |
| 382773 | 10 instances |
| 379808 | 10 instances |
| 379809 | 10 instances |
| 382776 | 10 instances |
| 379810 | 10 instances |
| 382779 | 10 instances |
| 382774 | 10 instances |
| 379811 | 10 instances |
| 379810 | 10 instances |
| 382775 | 10 instances |
| 382777 | 10 instances |
| 379807 | 10 instances |

379810 & 382779

ASSISTment ID: 290446 [Comment on this question](#)

The two equilateral triangles below are similar figures. What is the scale factor from the small triangle on the left to the large triangle on the right? The triangles are not drawn to scale.



Type your answer below (mathematical expression):

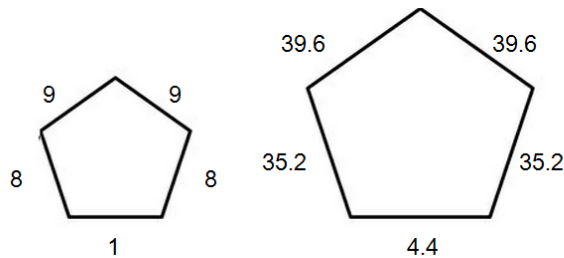
- The student needs to find the scalefactor from the small equilateral triangle to the large equilateral triangle.
- All of the numbers in the above problem are variabilized.
- Each of the sides of the small triangle are a random number from 1 to 12.
- Each of the sides of the large triangle are a the side length of the small triangle multiplied by a scalefactor.
- 379810 asks for large to small scalefactor, 382779 asks for small to large scalefactor
- The scale factor for 382779 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379810 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

382778 & 379806

ASSISTment ID: 291005

[Comment on this question](#)

The two pentagons seen below are similar figures. What is the scale factor from the small pentagon on the left to the large pentagon on the right? The pentagons are not drawn to scale.



Type your answer below (mathematical expression):

Submit Answer

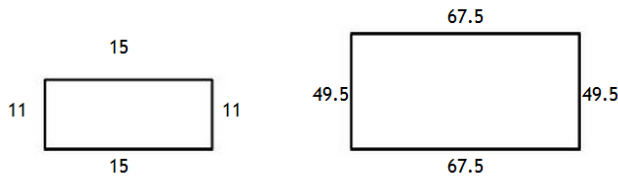
Show Hint 1 of 2

- The student needs to find the scalefactor from the small pentagon to the large pentagon.
- All of the numbers in the above problem are variabilized.
- The side length of the bottom of the small pentagon is a random number from 1 to 12.
- The side lengths of both the bottom left and bottom right sides are the same for each pentagon.
- The side lengths of both the bottom left and bottom right sides of the small pentagon are a random number from 1 to 12.
- The side lengths of both the top left and top right sides are the same for each pentagon.
- The side lengths of both the top left and top right sides of the small pentagon are a random number from 1 to 12.
- All of the sides of the large pentagon are simply scale factor multiples of the same side lengths seen for the small pentagon.
- 382778 asks for large to small scalefactor, 379806 asks for small to large scalefactor
- The scale factor for 382778 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379806 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

382777 & 379807

ASSISTment ID: 291042 [Comment on this question](#)

The two rectangles below are similar figures. What is the scale factor from the small rectangle on the left to the large rectangle on the right? The rectangles are not drawn to scale.



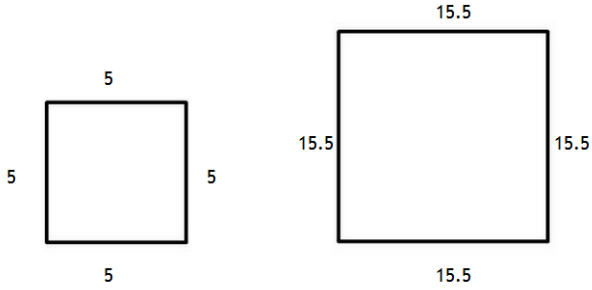
Type your answer below (mathematical expression):

- The student needs to find the scalefactor from the small rectangle to the large rectangle.
- All of the numbers in the above problem are variabilized.
- The side lengths of both the bottom and top sides of the small rectangle are the same.
- The side lengths of both the bottom and top sides of the small rectangle are a random number from 13 to 24.
- The side lengths of both the left and right sides of the small rectangle are the same.
- The side lengths of both the left and right sides of the small rectangle are a random number from 1 to 12.
- All of the sides of the large rectangle are simply scale factor multiples of the same side lengths seen for the small rectangle.
- 382777 asks for large to small scalefactor, 379807 asks for small to large scalefactor
- The scale factor for 382777 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379807 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

382773 & 379808

ASSISTment ID: 291117 [Comment on this question](#)

The two squares below are similar figures. What is the scale factor from the small square on the left to the large square on the right? The squares are not drawn to scale.



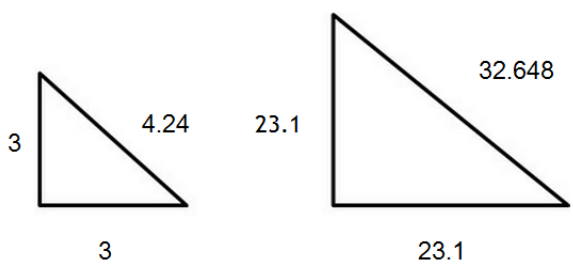
Type your answer below (mathematical expression):

- The student needs to find the scalefactor from the small square to the large square.
- All of the numbers in the above problem are variabilized.
- All of the side lengths for the small square are the same.
- The side lengths of the small square are a random number from 1 to 12.
- All of the sides of the large square are simply scale factor multiples of the same side lengths seen for the small square.
- 379808 asks for large to small scalefactor, 382773 asks for small to large scalefactor
- The scale factor for 379808 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 382773 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

379809 & 382776

ASSISTment ID: 291180 [Comment on this question](#)

The two right triangles seen below are similar figures.
 What is the scale factor from the small right triangle on the left to the large right triangle on the right? The right triangles are not drawn to scale.



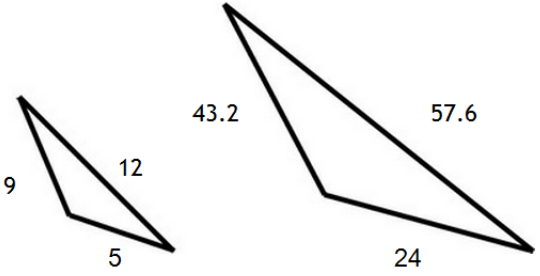
Type your answer below (mathematical expression):

- The student needs to find the scalefactor from the small right triangle to the large right triangle.
- All of the numbers in the above problem are variabilized.
- The side length the bottom leg of the small right triangle is a random number from 1 to 12.
- The side length the left leg of the small right triangle is a random number from 1 to 12.
- The side length of the hypotenuse of the small right triangle is found using the Pythagorean Theorem with the other two legs of the triangle.
- All of the sides of the large right triangle are simply scale factor multiples of the same side lengths seen for the small right triangle.
- 382776 asks for large to small scalefactor, 379808 asks for small to large scalefactor
- The scale factor for 382776 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379808 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

379810 & 382775

ASSISTment ID: 291214 [Comment on this question](#)

The two scalene triangles seen below are similar figures. What is the scale factor from the small scalene triangle on the left to the large scalene triangle on the right? The scalene triangles are not drawn to scale.



Type your answer below (mathematical expression):

- The student needs to find the scalefactor from the small scalene triangle to the large scalene triangle.
- All of the numbers in the above problem are variabilized.
- The side length the bottom leg of the small scalene triangle is a random number from 1 to 7.
- The side length the left leg of the small scalene triangle is a random number from 4 to 10.
- The side length of the hypotenuse of the small scalene triangle is a random number from 6 to 16.
- All of the sides of the large scalene triangle are simply scale factor multiples of the same side lengths seen for the small scalene triangle.
- 382775 asks for large to small scalefactor, 379810 asks for small to large scalefactor
- The scale factor for 382775 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379810 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

382774 & 379811

ASSISTment ID: 291290 [Comment on this question](#)

The two right trapezoids seen below are similar figures. What is the scale factor from the small right trapezoid on the left to the large right trapezoid on the right? The right trapezoids are not drawn to scale.

Type your answer below (mathematical expression):

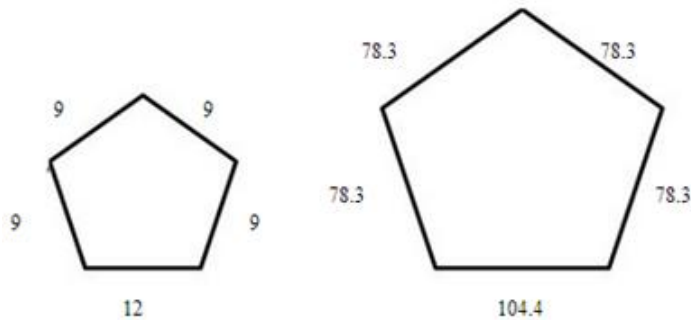
- The student needs to find the scalefactor from the small right trapezoid to the large right trapezoid.
- All of the numbers in the above problem are variabilized.
- The side length of the left side of the small right trapezoid is a random number from 1 to 9.
- The side length of the top side of the small right trapezoid is a random number from 1 to 7.
- The side length of the bottom side of the small right trapezoid is the top side length of the figure added to a random number from 1 to 5.
- The side length of the right side of the small right trapezoid is found using the Pythagorean Theorem with the random number added to the bottom side of the small right trapezoid and the height of the trapezoid, which is the same as the left side of the small right trapezoid.
- All of the sides of the large right trapezoid are simply scale factor multiples of the same side lengths seen for the small right trapezoid.
- 382774 asks for large to small scalefactor, 379811 asks for small to large scalefactor
- The scale factor for 382774 is $1/\text{denom}$, where denom is a number from 1.1 to 9.9.
- The scale factor for 379811 is a number from 1.1 to 9.9.
- The answer is formatted as algebra.

Appendix A.4.2: Similar Figures Skill Sample Problem Print

Problem Set "Similar Figures Skill - sample assistments" id:[157527]

1) Assistent #382780 "382780 - 291005 - Calculations with Similar Figures - Pentagons - Large to Small"

The two pentagons seen below are similar figures. What is the scale factor from the large pentagon on the right to the small pentagon on the left? The pentagons are not drawn to scale.



Algebra:

✓ 1/8.7

Hints:

- Since these two pentagons are similar, we can make a ratio of any side length of the small pentagon in relation to the same corresponding side length of the large pentagon.

For example:

$$\frac{9}{78.3}$$

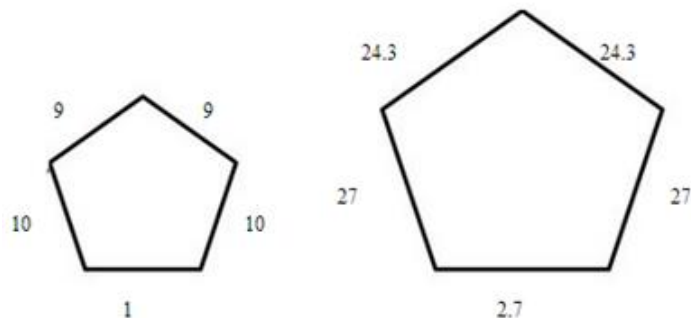
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small pentagon from the large pentagon.

$$\frac{9}{78.3} \div \frac{9}{9} = \frac{1}{8.7}$$

Therefore the correct scalefactor is 1/8.7. Type in 1/8.7.

2) Assistent #382900 "382900 - 291005 - Calculations with Similar Figures - Pentagons - Small to Large"

The two pentagons seen below are similar figures. What is the scale factor from the small pentagon on the left to the large pentagon on the right? The pentagons are not drawn to scale.



Algebra:

✓ 2.7

Hints:

- Since these two pentagons are similar, we can make a ratio of any side length of the large pentagon in relation to the same corresponding side length of the small pentagon.

For example:

$$\frac{27}{10}$$

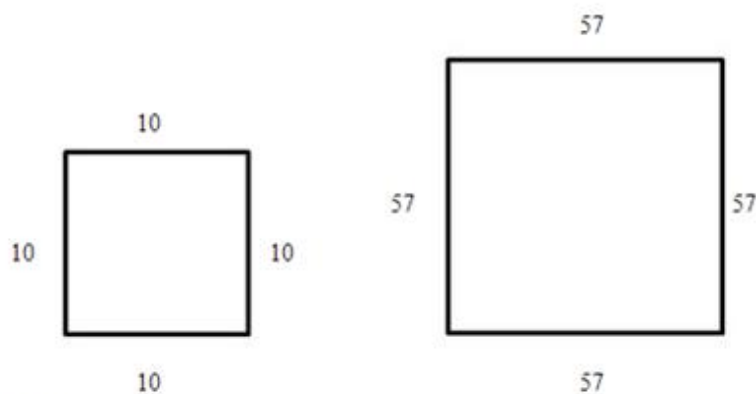
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large pentagon from the small pentagon.

$$\frac{27}{10} \div \frac{10}{10} = \frac{2.7}{1}$$

Therefore the correct scalefactor is 2.7. Type in 2.7.

3) Assistentment #382790 "382790 - 291117 - Calculations with Similar Figures - Square - Large to Small"

The two squares below are similar figures. What is the scale factor from the large square on the right to the small square on the left? The squares are not drawn to scale.



Algebra:

✓ 1/5.7

Hints:

- Since the two squares are similar, we can make a ratio of any side length of the small square in relation to the same corresponding side length of the large square.

For example:

$$\frac{10}{57}$$

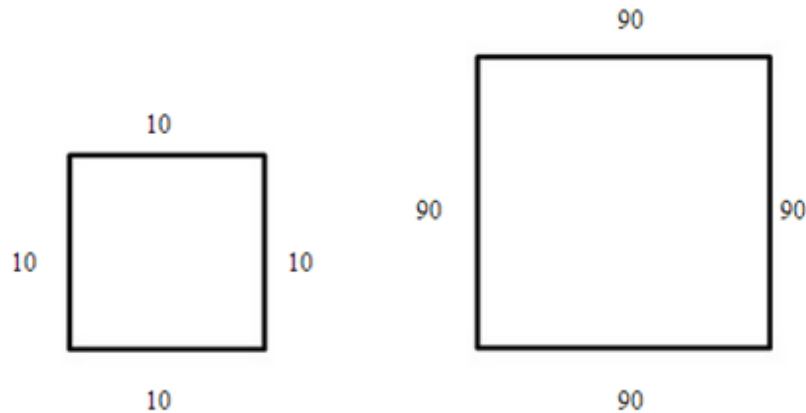
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small square from the large square.

$$\frac{10}{57} \div \frac{10}{10} = \frac{1}{5.7}$$

Therefore the correct scalefactor is 1/5.7. Type in 1/5.7.

4) Assistentment #382810 "382810 - 291117 - Calculations with Similar Figures - Square - Small to Large"

The two squares below are similar figures. What is the scale factor from the small square on the left to the large square on the right? The squares are not drawn to scale.



Algebra:

✓ 9

Hints:

- Since the two squares are similar, we can make a ratio of any side length of the large square in relation to the same corresponding side length of the small square.

For example:

$$\frac{90}{10}$$

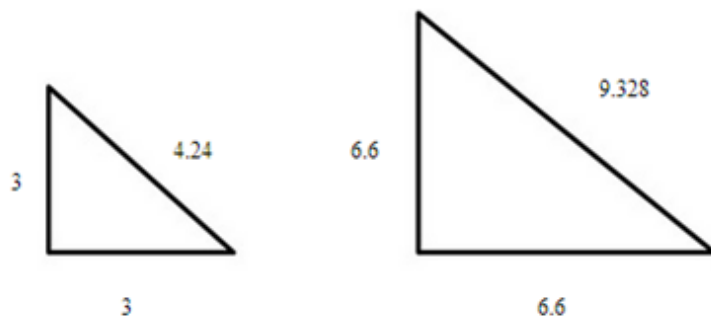
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large square from the small square.

$$\frac{90}{10} \div \frac{10}{10} = \frac{9}{1}$$

Therefore the correct scalefactor is 9. Type in 9.

5) Assistentment #382890 "382890 - 291180 - Calculations with Similar Figures - Right Triangle - Large to Small"

The two right triangles seen below are similar figures. What is the scale factor from the large right triangle on the right to the small right triangle on the left? The right triangles are not drawn to scale.



Algebra:

✓ 1/2.2

Hints:

- Since these two right triangles are similar, we can make a ratio of any side length of the small right triangle in relation to the same corresponding side length of the large right triangle.

For example:

$$\frac{3}{6.6}$$

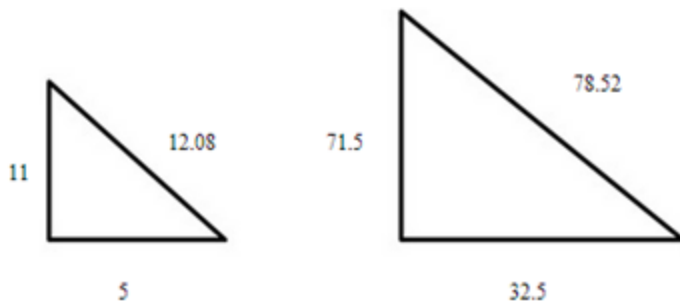
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small right triangle from the large right triangle.

$$\frac{3}{6.6} \div \frac{3}{3} = \frac{1}{2.2}$$

Therefore the correct scalefactor is 1/2.2. Type in 1/2.2.

6) Assisment #382820 "382820 - 291180 - Calculations with Similar Figures - Right Triangle - Small to Large"

The two right triangles seen below are similar figures. What is the scale factor from the small right triangle on the left to the large right triangle on the right? The right triangles are not drawn to scale.



Algebra:

✓ 6.5

Hints:

- Since these two right triangles are similar, we can make a ratio of any side length of the large right triangle in relation to the same corresponding side length of the small right triangle.

For example:

$$\frac{71.5}{11}$$

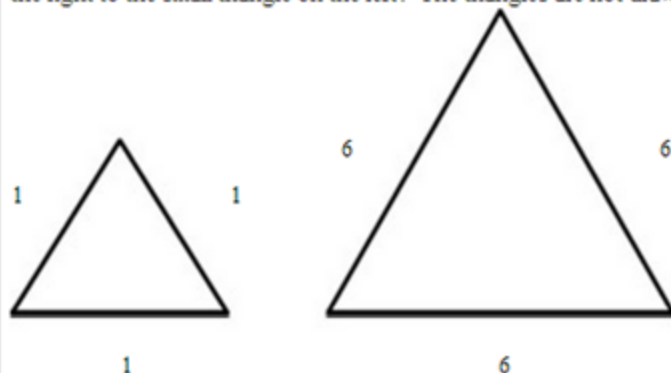
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large right triangle from the small right triangle.

$$\frac{71.5}{11} \div \frac{11}{11} = \frac{6.5}{1}$$

Therefore the correct scalefactor is 6.5. Type in 6.5.

7) Assistent #382830 "382830 - 290446 - Calculations with Similar Figures - Equilateral Triangle - Large to Small"

The two equilateral triangles below are similar figures. What is the scale factor from the large triangle on the right to the small triangle on the left? The triangles are not drawn to scale.



Algebra:

✓ 1/6

Hints:

- An equilateral triangle has 3 sides of equal length and since all side lengths are the same on both triangles there must be a scalefactor that allows them to be similar figures.
- We can make a ratio of any side length of the small triangle in relation to the same corresponding side length of the large triangle.

For example:

$$\frac{1}{6}$$

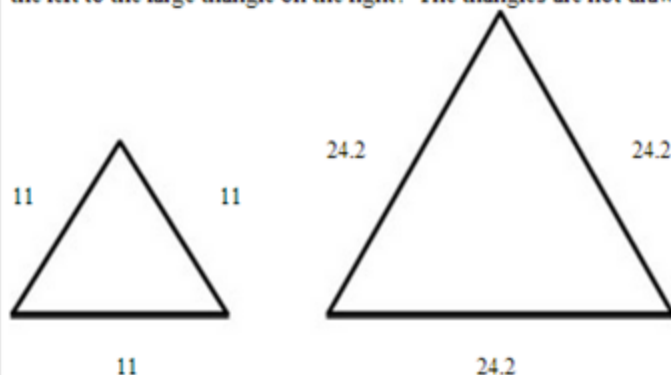
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small triangle from the large triangle.

$$\frac{1}{6} \div \frac{1}{1} = \frac{1}{6}$$

Therefore the correct scalefactor is 1/6. Type in 1/6.

8) Assistent #382860 "382860 - 290446 - Calculations with Similar Figures - Equilateral Triangle - Small to Large"

The two equilateral triangles below are similar figures. What is the scale factor from the small triangle on the left to the large triangle on the right? The triangles are not drawn to scale.



Algebra:

✓ 2.2

Hints:

- An equilateral triangle has 3 sides of equal length and since all side lengths are the same on both triangles there must be a scalefactor that allows them to be similar figures.
- We can make a ratio of any side length of the large triangle in relation to the same corresponding side length of the small triangle.

For example:

$$\frac{24.2}{11}$$

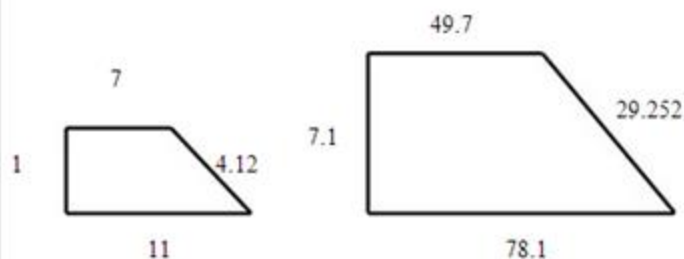
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large triangle from the small triangle.

$$\frac{24.2}{11} \div \frac{11}{11} = \frac{2.2}{1}$$

Therefore the correct scalefactor is 2.2. Type in 2.2.

9) Assistent #382840 "382840 - 291290 - Calculations with Similar Figures - Right Trapezoid - Large to Small"

The two right trapezoids seen below are similar figures. What is the scale factor from the large right trapezoid on the right to the small right trapezoid on the left? The right trapezoids are not drawn to scale.



Algebra:

✓ 1/7.1

Hints:

- Since these two right trapezoids are similar, we can make a ratio of any side length of the small right trapezoid in relation to the same corresponding side length of the large right trapezoid.

For example:

$$\frac{1}{7.1}$$

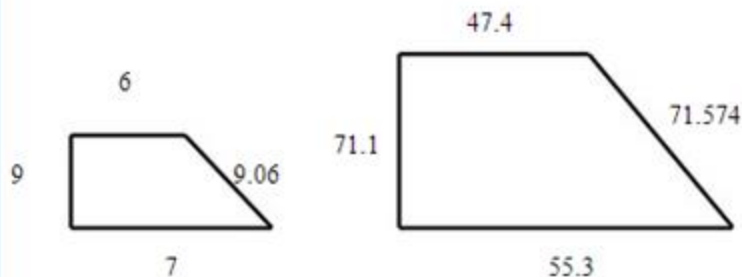
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small right trapezoid from the large right trapezoid.

$$\frac{1}{7.1} \div \frac{1}{1} = \frac{1}{7.1}$$

Therefore the correct scalefactor is 1/7.1. Type in 1/7.1.

10) Assistentment #382880 "382880 - 291290 - Calculations with Similar Figures - Right Trapezoid - Small to Large"

The two right trapezoids seen below are similar figures. What is the scale factor from the small right trapezoid on the left to the large right trapezoid on the right? The right trapezoids are not drawn to scale.



Algebra:

✓ 7.9

Hints:

- Since these two right trapezoids are similar, we can make a ratio of any side length of the large right trapezoid in relation to the same corresponding side length of the small right trapezoid.

For example:

$$\frac{71.1}{9}$$

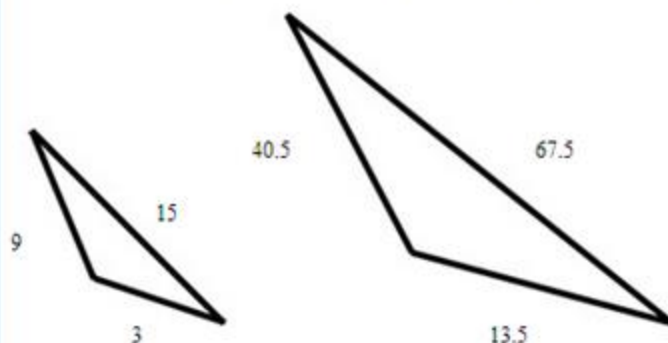
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large right trapezoid from the small right trapezoid.

$$\frac{71.1}{9} \div \frac{9}{9} = \frac{7.9}{1}$$

Therefore the correct scalefactor is 7.9. Type in 7.9.

11) Assistentment #382870 "382870 - 291214 - Calculations with Similar Figures - Other Triangle - Large to Small"

The two scalene triangles seen below are similar figures. What is the scale factor from the large scalene triangle on the right to the small scalene triangle on the left? The scalene triangles are not drawn to scale.



Algebra:

✓ 1/4.5

Hints:

- Since these two scalene triangles are similar, we can make a ratio of any side length of the small scalene triangle in relation to the same corresponding side length of the large scalene triangle.

For example:

$$\frac{9}{40.5}$$

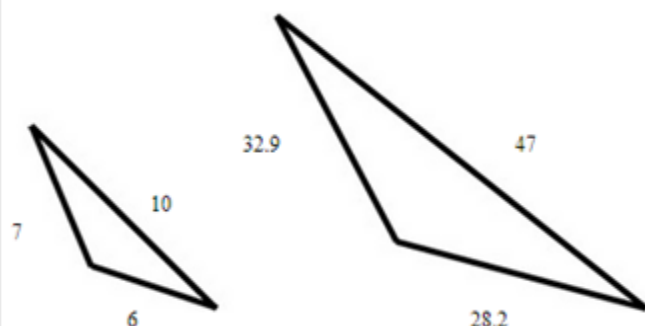
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small scalene triangle from the large scalene triangle.

$$\frac{9}{40.5} \div \frac{9}{9} = \frac{1}{4.5}$$

Therefore the correct scalefactor is 1/4.5. Type in 1/4.5.

12) Assistent #382850 "382850 - 291214 - Calculations with Similar Figures - Other Triangle - Small to Large"

The two scalene triangles seen below are similar figures. What is the scale factor from the small scalene triangle on the left to the large scalene triangle on the right? The scalene triangles are not drawn to scale.



Algebra:

✓ 4.7

Hints:

- Since these two scalene triangles are similar, we can make a ratio of any side length of the large scalene triangle in relation to the same corresponding side length of the small scalene triangle.

For example:

$$\frac{32.9}{7}$$

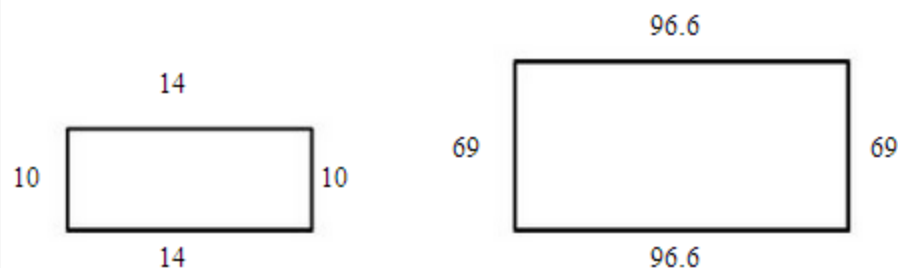
- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large scalene triangle from the small scalene triangle.

$$\frac{32.9}{7} \div \frac{7}{7} = \frac{4.7}{1}$$

Therefore the correct scalefactor is 4.7. Type in 4.7.

13) Assistentment #382930 "382930 - 291042 - Calculations with Similar Figures - Rectangle - Large to Small"

The two rectangles below are similar figures. What is the scale factor from the large rectangle on the right to the small rectangle on the left? The rectangles are not drawn to scale.



Algebra:

✓ 1/6.9

Hints:

- Since the two rectangles are similar, we can make a ratio of any side length of the small rectangle in relation to the same corresponding side length of the large rectangle.

For example:

$$\frac{14}{96.6}$$

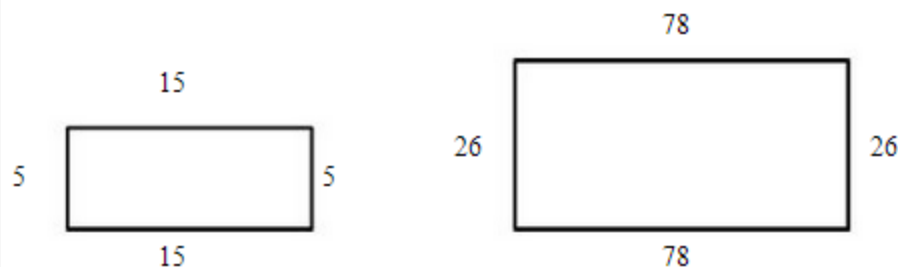
- After you simplify the ratio, the new fraction is the scalefactor that can be used to acquire the small rectangle from the large rectangle.

$$\frac{14}{96.6} \div \frac{14}{14} = \frac{1}{6.9}$$

Therefore the correct scalefactor is 1/6.9. Type in 1/6.9.

14) Assistentment #382920 "382920 - 291042 - Calculations with Similar Figures - Rectangle - Small to Large"

The two rectangles below are similar figures. What is the scale factor from the small rectangle on the left to the large rectangle on the right? The rectangles are not drawn to scale.



Algebra:

✓ 5.2

Hints:

- Since the two rectangles are similar, we can make a ratio of any side length of the large rectangle in relation to the same corresponding side length of the small rectangle.

For example:

$$\frac{78}{15}$$

- After you simplify the ratio, the numerator of the new fraction is the scalefactor that can be used to acquire the large rectangle from the small rectangle.

$$\frac{78}{15} \div \frac{15}{15} = \frac{5.2}{1}$$

Therefore the correct scalefactor is 5.2. Type in 5.2.

Appendix B: Documentation & Problem Sets Created by James Beaulieu

Appendix B.1.1: Equally Likely Skill Documentation

| Skill | Common Core State Standard |
|----------------|----------------------------|
| Equally Likely | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 58512 | 28 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

| | |
|--------|--------|
| 347293 | 342629 |
| 347292 | 342628 |
| 356230 | 342627 |
| 347291 | 342626 |
| 347290 | 342624 |
| 347289 | 342623 |
| 347286 | 342622 |
| 347285 | 342621 |
| 347284 | 342615 |
| 347283 | 342613 |
| 347128 | 342612 |
| 356231 | 342611 |
| 347126 | 342610 |
| 347125 | 341665 |

347293

Assistment ID: 347293 [Comment on this question](#)

If you have a bag of M&M's, and you know the bags have more dark colored (brown, blue, and red) candy than lighter colored (green, yellow, and orange), is it more, less, or equally likely that you'll pull out a blue as opposed to a yellow?

Select one:

☒ More
☐ Equally
☐ Less

- This is a standard assistment
- The student is asked a question about the likelihood of an event concerning a particular context
- Type: Multiple Choice
- Answer: More

347292

Assistment ID: 347292 [Comment on this question](#)

Which of these things seem least likely to find at a park?

Select one:

☒ Benches
☐ The President
☐ Trees
☐ Grass
☐ People jogging

- This is a standard assistment
- Students are asked a question about the likelihood of an event, largely based on the context
- Type: Multiple Choice
- Answer: The President

356230

Assistment ID: 356230 [Comment on this question](#)

Which of these things seem least likely to find at a park?

Select one:

☒ Children playing

☐ Bushes

☐ Dogs

☐ A pond with ducks

☐ Dinosaurs

- This is a standard assistment
- The students are asked a context-based likelihood question
- Type: Multiple Choice
- Answer: Dinosaurs

347291

Assistment ID: 347291 [Comment on this question](#)

What's the most likely thing to expect going into the doctor's office?

Select one:

☒ Their will be football players running around in the waiting room

☐ A giraffe is waiting to see your doctor too

☐ The doctor will be nice and take your temperature

☐ You'll have grown 8 feet since your last visit

- This is a standard assistment
- Students are asked a question about the likelihood of an event in a particular context
- Type: Multiple Choice
- Answer: Your doctor will be nice and take your temperature

347290

Assistment ID: 347290 [Comment on this question](#)

If you have a standard deck of cards like the one shown below (without Jokers), choose the least likely if you draw 1 card:



Select one:

☐ You draw a 5

☐ You draw the Queen of spades

☐ You draw a red 3

☐ You draw a heart

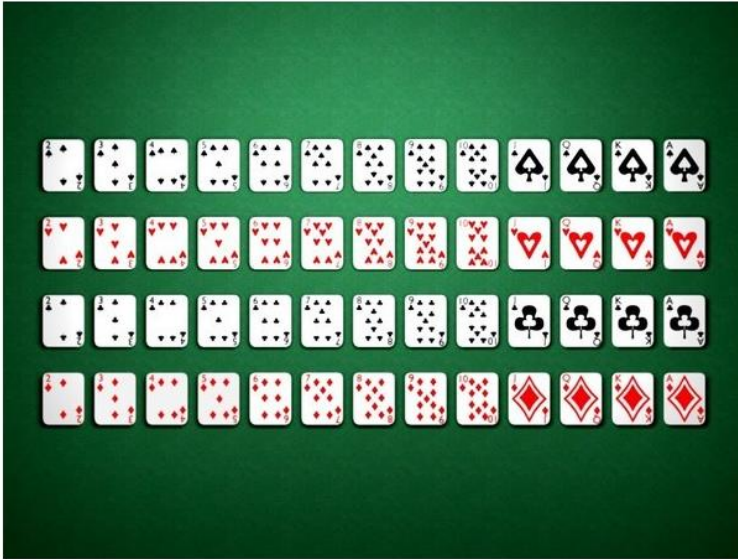
- This is a standard assistment
- Students are asked a problem about the likelihood of pulling one card over another
- To some extent this problem assumes prior knowledge of how a deck of cards is structured, though a picture is provided
- Type: Multiple Choice
- Answer: You draw the Queen of spades

347289

Assistment ID: 347289

[Comment on this question](#)

If you have a standard deck of cards like the one shown below (without Jokers), choose the least likely if you draw 1 card:



Select one:

- ☒ You draw a spade
- ☐ You draw a 7
- ☐ You draw a black card
- ☐ They are equally likely

Submit Answer

- This is a standard assistment
- Students are asked a problem about the likelihood of pulling one card over another
- To some extent this problem assumes prior knowledge of how a deck of cards is structured, though a picture is provided
- Type: Multiple Choice
- Answer: You draw a 7

347286

Assistment ID: 347286 [Comment on this question](#)

Is it more likely that a random radio station would be playing a country song, a jazz song, or a rock song if you turned it on at a random instant?

Select one:

☐ Country

☐ Jazz

☐ Rock

☐ There's equal chance of any of them

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event given the context of music on the radio
- Type: Multiple Choice
- Answer: There's equal chance of any of them

347285

Assistment ID: 347285 [Comment on this question](#)

If you reach into a bowl of Halloween candy, and there 10 times as many Twix and Snickers than Twistlers and Reese's, would you say it's more, less, or equally likely that you'll pull out a Twix as opposed to a Reese's?

Select one:

☒ More

☐ Less

☐ Equally

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event based on a given context
- Type: Multiple Choice
- Answer: More

347284

Assistment ID: 347284 [Comment on this question](#)

If you have a bag of M&M's, and the colors of the candies are random, is it more, less, or equally likely that you'll pull out a blue as opposed to a red?

Select one:

☒ Less

☐ More

☐ Equally

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event based on the given context
- Type: Multiple Choice
- Answer: Equally

347283

Assistment ID: 347283 [Comment on this question](#)

What is the most likely thing a waiter at a restaurant might bring you if you ordered chicken fingers?

Select one:

☒ Chicken fingers

☐ A toilet

☐ Tiger's toes

☐ A rubber tire

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event given the context
- Type: Multiple Choice
- Answer: Chicken Fingers

347128

Assistment ID: 347128 [Comment on this question](#)

What is a grocery store most likely to sell?

Select one:

☒ Oranges

☐ Furniture

☐ Pants

☐ Gasoline

- This is a standard assistment
- The students are asked about the likelihood of an event given the context
- Type: Multiple Choice
- Answer: Oranges

356231

Assistment ID: 356231 [Comment on this question](#)

What is a grocery store least likely to sell?

Select one:

☒ Chewing Gum

☐ Elephants

☐ Donuts

☐ Bananas

- This is a standard assistment
- Students are asked about the likelihood of an event given the context
- Type: Multiple Choice
- Answer: Elephants

347126

Assistment ID: 347126

[Comment on this question](#)

You have a standard 6-sided die that you are to roll 4 times.

True or false: It is equally likely that you roll 2, 4, 5, and 5 as if you roll a 4, 4, 4, and 4?

Select one:

☒ False

☐ True

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event given two possibilities of a given event
- Type: Multiple Choice
- Answer: True

347125

Assistment ID: 347125

[Comment on this question](#)

You have a standard 12-sided die that you are to roll 6 times. True or false: It is equally likely that you will roll a 4 every time as if you roll a 12, then a 1, then a 5, then two 6's, and finally a 7?

Select one:

☒ True

☐ False

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of two possible outcomes of an event
- Type: Multiple Choice
- Answer: True

342629

Assistment ID: 342629 [Comment on this question](#)

What's the least likely thing to expect going into the doctor's office?

Select one:

☒ You'll have grown since your last visit

☐ The doctor will be nice and take your temperature

☐ Their will be magazines to read in the waiting room

☐ A giraffe is waiting to see your doctor too

- This is a standard assistment
- Students are asked about the likelihood of an event given the context
- Type: Multiple Choice
- Answer: A giraffe is waiting to see your doctor too

342628

Assistment ID: 342628 [Comment on this question](#)

Is it equally likely that a kid would find his mother in the kitchen as if he would find aliens in the kitchen when he got home from school?

Select one:

☒ Yes

☐ No

- This is a standard assistment
- Students are asked to compare the likelihood of two possibilities of an event given the context
- Type: Multiple Choice
- Answer: No

342627

Assistment ID: 342627

[Comment on this question](#)

What are you most likely to see when you walk in to school in the morning?

Select one:

- ☒ Zoo animals learning math
- ☐ Teachers doing cartwheels
- ☐ Students going to their classrooms

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of an event given a familiar context
- Type: Multiple Choice
- Answer: Students going to their classrooms

342626

Assistment ID: 342626

[Comment on this question](#)

If you have a standard deck of cards (without Jokers), choose the most likely if you draw 1 card:

Select one:

- ☒ You draw a heart
- ☐ You draw the Queen of spades
- ☐ You draw a red 3
- ☐ You draw a 5

Submit Answer

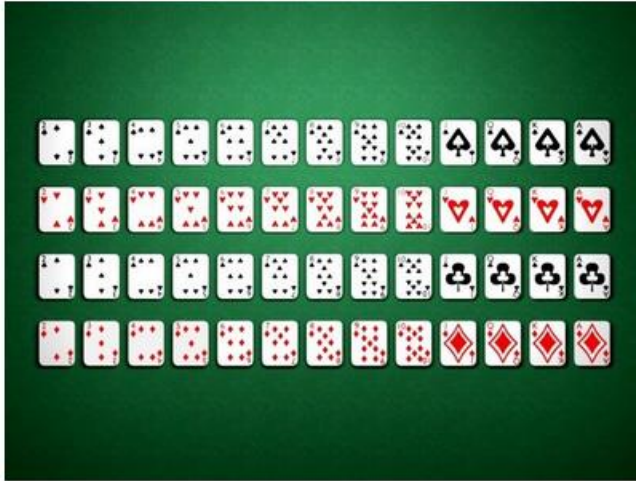
- This is a standard assistment
- Students are asked a problem about the likelihood of pulling one card over another
- To some extent this problem assumes prior knowledge of how a deck of cards is structured, though a picture is provided (not shown here)
- Type: Multiple Choice
- Answer: You draw a heart

342624

Assistment ID: 342624

[Comment on this question](#)

If you have a standard deck of cards like the one shown below (without Jokers), choose the most likely if you draw 1 card:



Select one:

- ☒ You draw a spade
- ☐ You draw a 7
- ☐ You draw a black card
- ☐ All of the above

Submit Answer

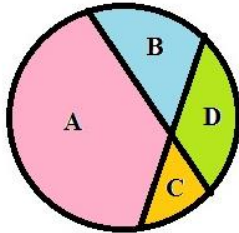
- This is a standard assistment
- Students are asked a problem about the likelihood of pulling one card over another
- To some extent this problem assumes prior knowledge of how a deck of cards is structured, though a picture is provided
- Type: Multiple Choice
- Answer: You draw a black card

342623

Assistment ID: 342623

[Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Select one:

- ☒ More
☐ Less
☐ Equally

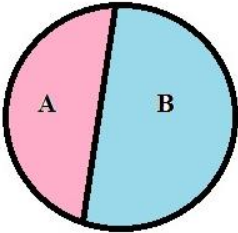
Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342622

Assistment ID: 342622 [Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Select one:

☒ More

☐ Less

☐ Equally

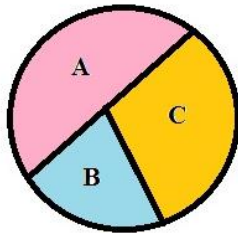
- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342621

Assistment ID: 342621

[Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on C opposed to B?



Select one:

- ☒ More
☐ Less
☐ Equally

Submit Answer

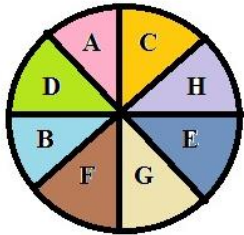
- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342615

Assistment ID: 342615

[Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on B opposed to A?



Select one:

- ☒ More
☐ Less
☐ Equally

Submit Answer

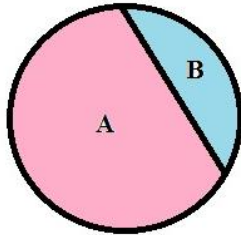
- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342613

Assistment ID: 342613

[Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on B opposed to A?



Select one:

- ☒ More
☐ Less
☐ Equally

Submit Answer

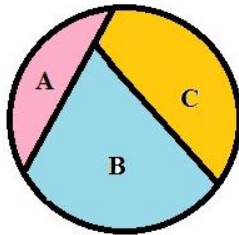
- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342612

Assistment ID: 342612

[Comment on this question](#)

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Select one:

- ☒ More
☐ Less
☐ Equally

Submit Answer

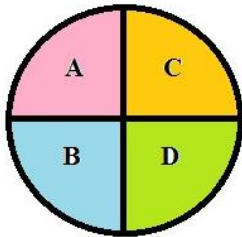
- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342611

Assistment ID: 342611

[Comment on this question](#)

If you toss a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Select one:

- ☒ More
☐ Less
☐ Equally

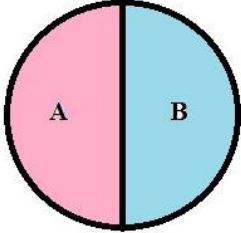
Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

342610

Assistment ID: 342610 [Comment on this question](#)

If you toss a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Select one:

☒ More

☐ Less

☐ Equally

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of different landing positions of a coin
- Context partly provided by image
- Type: Multiple Choice
- Answer: More

341665

Assistment ID: 341665 [Comment on this question](#)

You have a standard 6-sided die that you are to roll 3 times.
True or false: It is equally likely that you will roll a 4 every time as if you roll a 6, a 1, and a 2.

Select one:

☒ True

☐ False

Submit Answer

- This is a standard assistment
- Students are asked about the likelihood of two possible outcomes of an event
- Type: Multiple Choice
- Answer: True

Appendix B.1.2: Equally Likely Skill Sample Problem Print

Problem Set "Equally Likely" 40 (33512)

1) Assistent #341665 "341665 - Assistent #341665"

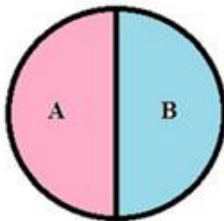
You have a standard 6-sided die that you are to roll 3 times. True or false: It is equally likely that you will roll a 4 every time as if you roll a 6, a 1, and a 2.

Multiple choice:

- ☒ True
- ☐ False
 - Because each roll of a die is an independent event, the results of each roll don't affect the chances of each number on later rolls.

2) Assistent #342610 "342610 - Assistent #342610"

If you toss a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?

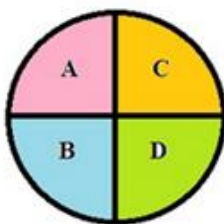


Multiple choice:

- ☐ More
- ☐ Less
- ☒ Equally

3) Assistent #342611 "342611 - Assistent #342611"

If you toss a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?

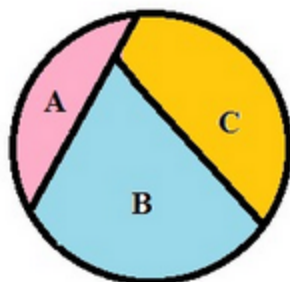


Multiple choice:

- ☐ More
- ☐ Less
- ☒ Equally

4) Assistent #342612 "342612 - Assistent #342612"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?

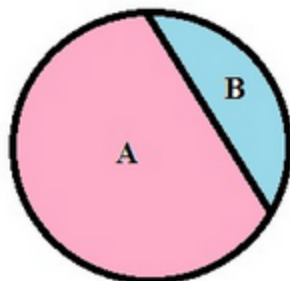


Multiple choice:

- ☐ More
- ☒ Less
- ☐ Equally

5) Assistent #342613 "342613 - Assistent #342613"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on B opposed to A?



Multiple choice:

- ☐ More
- ☒ Less
- ☐ Equally

6) Assistentment #342615 "342615 - Assistentment #342615"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on B opposed to A?

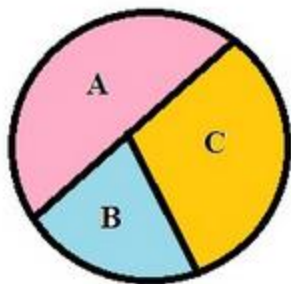


Multiple choice:

- ☐ More
- ☐ Less
- ☒ Equally

7) Assistentment #342621 "342621 - Assistentment #342621"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on C opposed to B?

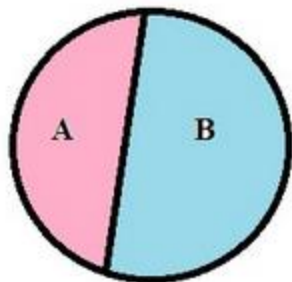


Multiple choice:

- ☒ More
- ☐ Less
- ☐ Equally

8) Assistentment #342622 "342622 - Assistentment #342622"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?

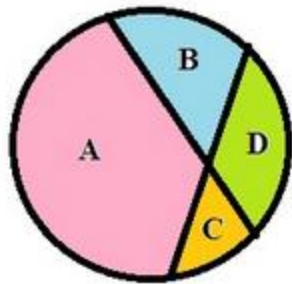


Multiple choice:

- ☒ More
- ☒ Less
- ☒ Equally

9) Assistentment #342623 "342623 - Assistentment #342623"

If you throw a coin onto the board shown, is it more, less, or equally likely that the coin will land on A opposed to B?



Multiple choice:

- ☒ More
 - ☒ Less
 - ☒ Equally
-

10) Assisment #342624 "342624 - Assisment #342624"

If you have a standard deck of cards like the one shown below (without Jokers), choose the most likely if you draw 1 card:



Multiple choice:

- ☐ You draw a spade
- ☐ You draw a 7
- ☒ You draw a black card
- ☐ All of the above

11) Assisment #342626 "342626 - Assisment #342626"

If you have a standard deck of cards (without Jokers), choose the most likely if you draw 1 card:

Multiple choice:

- ☐ You draw a red 3
- ☐ You draw the Queen of spades
- ☐ You draw a 5
- ☒ You draw a heart

12) Assisment #342627 "342627 - Assisment #342627"

What are you most likely to see when you walk in to school in the morning?

Multiple choice:

- ☒ Students going to their classrooms
- ☐ Teachers doing cartwheels
- ☐ Zoo animals learning math

13) Assisment #342628 "342628 - Assisment #342628"

Is it equally likely that a kid would find his mother in the kitchen as if he would find aliens in the kitchen when he got home from school?

Multiple choice:

- ☐ Yes
- ☒ No

14) Assisment #342629 "342629 - Assisment #342629"

What's the least likely thing to expect going into the doctor's office?

Multiple choice:

- ☐ Their will be magazines to read in the waiting room
- ☐ The doctor will be nice and take your temperature
- ☒ A giraffe is waiting to see your doctor too
- ☐ You'll have grown since your last visit

15) Assisment #347125 "347125 - Assisment #347125"

You have a standard 12-sided die that you are to roll 6 times. True or false: It is equally likely that you will roll a 4 every time as if you roll a 12, then a 1, then a 5, then two 6's, and finally a 7?

Multiple choice:

- ☒ True
- ☐ False
 - Because each roll of a die is an independent event, the results of each roll don't affect the chances of each number on later rolls.

16) Assistent #347126 "347126 - Assistent #347126"

You have a standard 6-sided die that you are to roll 4 times.

True or false: It is equally likely that you roll 2, 4, 5, and 5 as if you roll a 4, 4, 4, and 4?

Multiple choice:

- ☒ True
- ☒ False
 - Roll 1 does not affect Roll 2. If you roll a 4, you may not get a 4 again.

17) Assistent #347128 "347128 - Assistent #347128"

What is a grocery store most likely to sell?

Multiple choice:

- ☒ Oranges
- ☒ Pants
- ☒ Furniture
- ☒ Gasoline

18) Assistent #347129 "347129 - Assistent #347129"

Which of these things seem equally likely to find at a park? (2 answers)

Check all that apply:

- ☒ Trees
- ☒ Dinosaurs
- ☒ Grass
- ☒ Bulldozers
- ☒ The President
- ☒ A train

19) Assistent #347283 "347283 - Assistent #347283"

What is the most likely thing a waiter at a restaurant might bring you if you ordered chicken fingers?

Multiple choice:

- ☒ Chicken fingers
- ☒ A rubber tire
- ☒ Tiger's toes
- ☒ A toilet

20) Assistent #347284 "347284 - Assistent #347284"

If you have a bag of M&M's, and the colors of the candies are random, is it more, less, or equally likely that you'll pull out a blue as opposed to a red?

Multiple choice:

- ☒ More
 - Because the colors are random and unknown, the likelihood of drawing any color is equal.
- ☒ Less
 - Because the colors are random and unknown, the likelihood of drawing any color is equal.
- ☒ Equally

21) Assistent #347285 "347285 - Assistent #347285"

If you reach into a bowl of Halloween candy, and there 10 times as many Twix and Snickers than Twisters and Reese's, would you say it's more, less, or equally likely that you'll pull out a Twix as opposed to a Reese's?

Multiple choice:

- ☒ More
 - ☒ Less
 - Because there are a greater number of Twix than Reese's, it's more likely that you'd pick Twix at random.
 - ☒ Equally
 - Because there are a greater number of Twix than Reese's, it's more likely that you'd pick Twix at random.
-

22) Assistentment #347286 "347286 - Assistentment #347286"

Is it more likely that a random radio station would be playing a country song, a jazz song, or a rock song if you turned it on at a random instant?

Multiple choice:

☐ Country

- Because the radio station is random, there's no greater chance of the song being any one option over another, so they're equally likely.

☐ Jazz

- Because the radio station is random, there's no greater chance of the song being any one option over another, so they're equally likely.

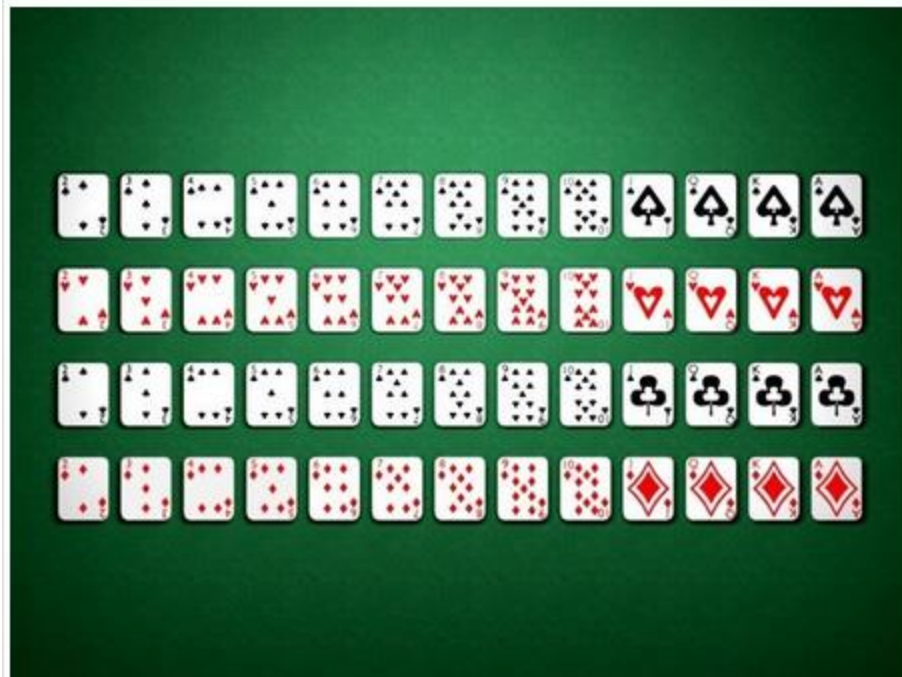
☐ Rock

- Because the radio station is random, there's no greater chance of the song being any one option over another, so they're equally likely.

☒ There's equal chance of any of them

23) Assistentment #347289 "347289 - Assistentment #347289"

If you have a standard deck of cards like the one shown below (without Jokers), choose the least likely if you draw 1 card:



Multiple choice:

☐ You draw a spade

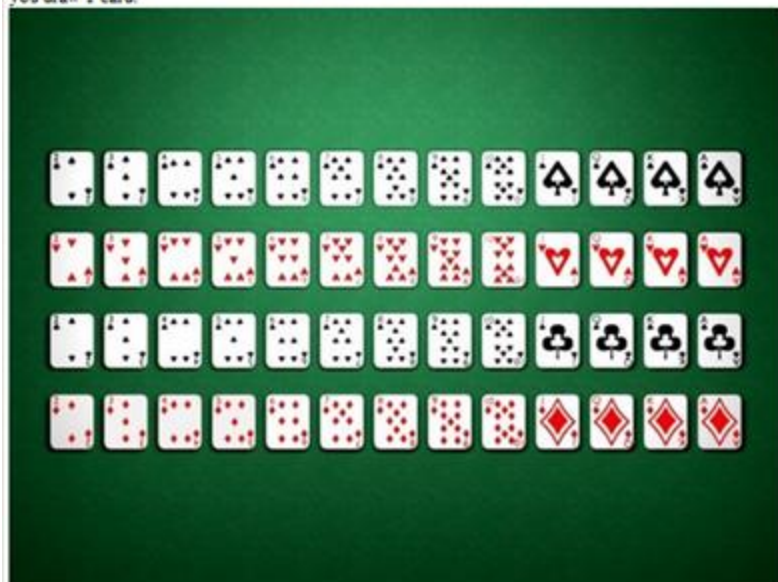
☒ You draw a 7

☐ You draw a black card

☐ They are equally likely

24) Assistent #347290 "347290 - Assistent #347290"

If you have a standard deck of cards like the one shown below (without Jokers), choose the least likely if you draw 1 card:



Multiple choice:

- ☒ You draw a red 3
- ☒ You draw the Queen of spades
- ☒ You draw a 5
- ☒ You draw a heart

25) Assistent #347291 "347291 - Assistent #347291"

What's the most likely thing to expect going into the doctor's office?

Multiple choice:

- ☒ Their will be football players running around in the waiting room
- ☒ The doctor will be nice and take your temperature
- ☒ A giraffe is waiting to see your doctor too
- ☒ You'll have grown 8 feet since your last visit

26) Assistent #347293 "347293 - Assistent #347293"

If you have a bag of M&M's, and you know the bags have more dark colored (brown, blue, and red) candy than lighter colored (green, yellow, and orange), is it more, less, or equally likely that you'll pull out a blue as opposed to a yellow?

Multiple choice:

- ☒ More
- ☒ Less
 - Because dark colors like blue are more common, you are more likely to pull a blue on a random draw than a lighter yellow.
- ☒ Equally
 - Because dark colors like blue are more common, you are more likely to pull a blue on a random draw than a lighter yellow.

27) Assistent #347292 "347292 - Assistent #347292"

Which of these things seem least likely to find at a park?

Multiple choice:

- ☒ Trees
- ☒ Grass
- ☒ Benches
- ☒ The President
- ☒ People jogging

28) Assistent #356231 "356231 - Assistent #356231"

What is a grocery store least likely to sell?

Multiple choice:

- ☒ Elephants
- ☐ Bananas
- ☐ Donuts
- ☐ Chewing Gum

29) Assistent #356230 "356230 - Assistent #356230"

Which of these things seem least likely to find at a park?

Multiple choice:

- ☐ A pond with ducks
 - ☐ Bushes
 - ☒ Dinosaurs
 - ☐ Children playing
 - ☐ Dogs
-

Appendix B.2.1: Bar Graphs Skill Documentation

| Skill | Common Core State Standard |
|------------|----------------------------|
| Bar Graphs | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 78955 | 7 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

361960

358589

357891

358601

357903

358531

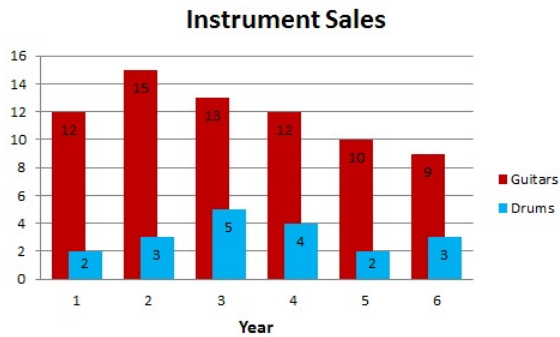
361959

361960

Assistment ID: 361960

[Comment on this question](#)

A young musician, Ethan, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



Type in the number of the year he sold the greatest number of guitars.

Type your answer below (mathematical expression):

Submit Answer

Help me on this question

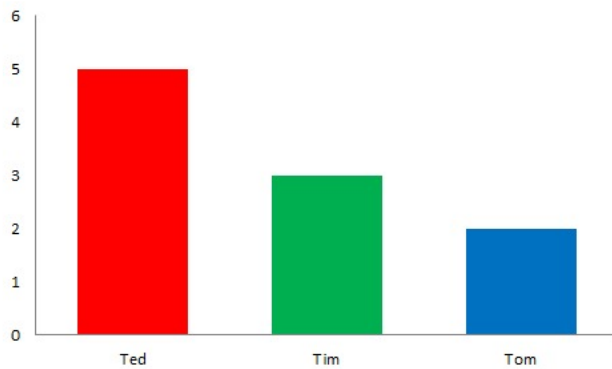
- This is a variabilized template
- Students are asked to extract data from a bar graph to answer a question
- The problem is based on the image being one of many graphs containing similar data and the instrument being asked about changes correspondingly
- Type: Algebra

358589

Assistment ID: 358589

[Comment on this question](#)

There was a pie eating contest at a local fair that three brothers, Ted, Tim, and Tom, competed against each other in. The number of pies they ate is shown in the bar graph:



Who lost the contest?

Select one:

- ☒ Tom
☐ Tim
☐ Ted

Submit Answer

Show hint 1 of 3

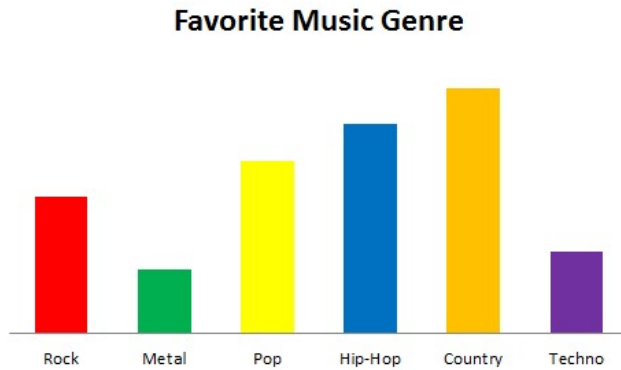
- This is a variabilized template
- Students are asked to answer a question given the data in the graph and the context of the data
- The graph image changes, sometimes with different names and data, and the answers change accordingly
- Type: Multiple choice

357891

Assistment ID: 357891

[Comment on this question](#)

A group of students answered a survey. The survey asked the students about what their favorite music genre was. The results are shown in a bar graph below:



What category had the greatest number of positive responses?

Type your answer below:

Submit Answer

Show hint 1 of 2

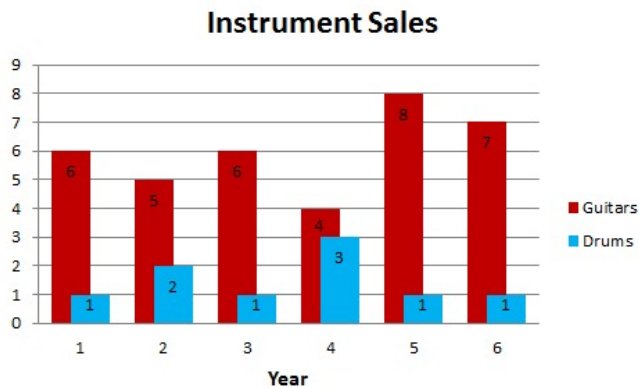
- This is a variabilized template
- Students are asked to answer a question about data contained in a bar graph given the context of the data
- There are a number of different graphs which switch, and the switch in graph is associated with the switch in context that also occurs. For example, another instance has a graph about favorite school subject
- Type: Fill in (setup to accept word with either capitalization or not)

358601

Assistment ID: 358601

[Comment on this question](#)

A young musician, Jay, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many guitars did he sell in the 2nd year?

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 3

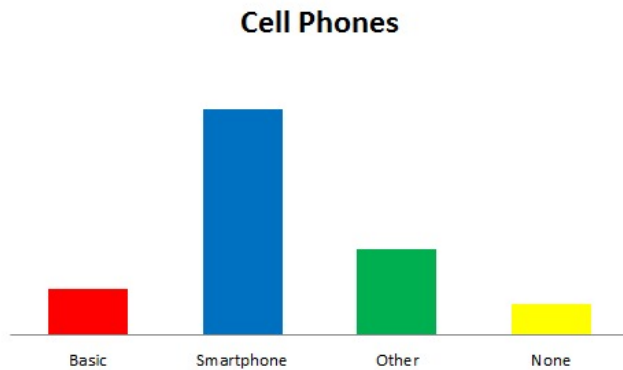
- This is a variabilized template
- Students are asked to answer a question about data presented in a bar graph given the context of the data
- The graphs change, though with the same context, and the question changes as well to ask about the different instruments and years
- Type: Algebra

357903

Assistment ID: 357903

[Comment on this question](#)

A group of students answered a survey. The survey asked the students about what cell phone they owned. The results are shown in a bar graph below:



What category had the lowest number of positive responses?

Type your answer below:

Submit Answer

Show hint 1 of 2

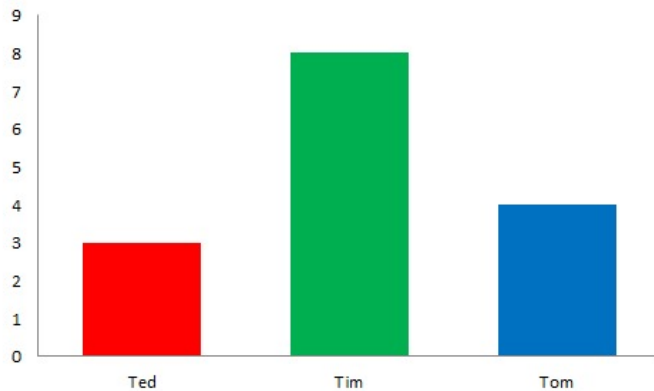
- This is a variabilized template
- Students are asked to answer a context sensitive question about data in a bar graph
- The graph changes, pulled from an array of graphs, and the context changes accordingly. For example, another instance is about students' favorite color
- Type: Fill in (will accept capitalized or not)

358531

Assistment ID: 358531

[Comment on this question](#)

There was a pie eating contest at a local fair that three brothers, Ted, Tim, and Tom, competed against each other in. The number of pies they ate is shown in the bar graph:



Who won the contest?

Select one:

- ☒ It was a tie
☐ Ted
☐ Tom
☐ Tim

Submit Answer

Show hint 1 of 3

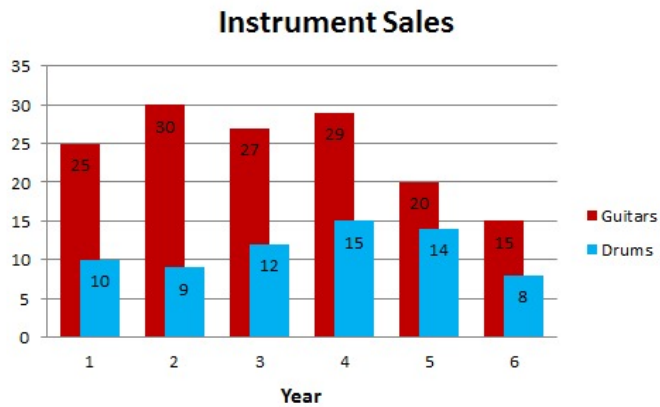
- This is a variabilized template
- Student is asked to answer a question given the context of the data presented in a graph
- The graphs change so that the answers change each time, and in some cases the context changes slightly, specifically the characters
- Type: Multiple Choice

361959

Assistment ID: 361959

[Comment on this question](#)

A young musician, Claire, decided to open her own music store to sell instruments and teach lessons. She plotted the first six years sales of her highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many more guitars than drum sets did she sell in the 4th year?

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 3

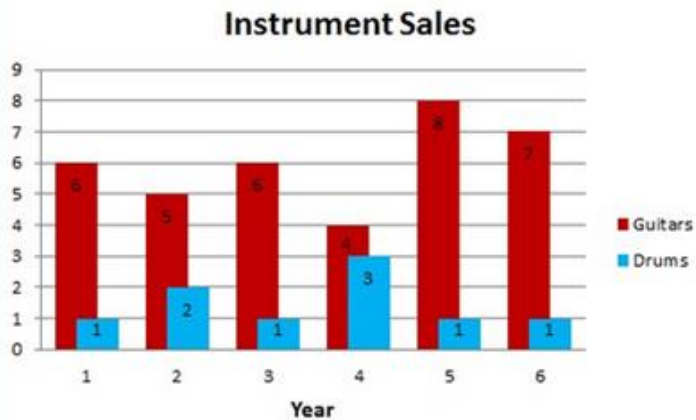
- This is a variabilized template
- Students are asked to answer a question about data in a bar graph given the context of the problem
- The graph changes, as does the year referenced in the question
- Type: Algebra

Appendix B.2.2: Bar Graphs Skill Sample Problem Print

Problem Set "Bar Graphs Skill - sample assistments" id:[157758]

1) Assistment #368373 "368373 - Instrument sales - greatest"

A young musician, Ethan, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



Type in the number of the year he sold the greatest number of drum sets.

Algebra:

✓ 4

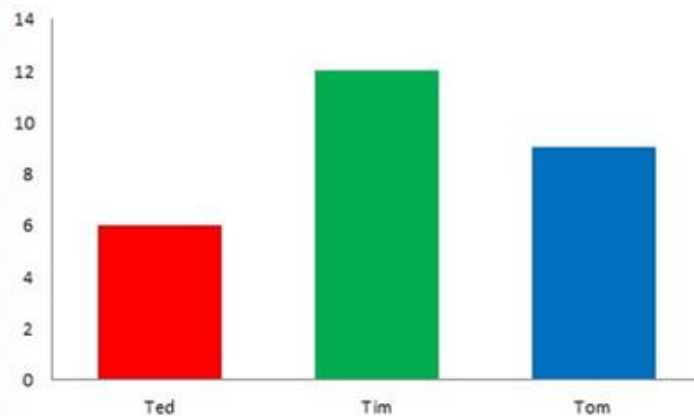
Hints:

- The question is asking about drum sets, so the columns you're focusing on are the blue bars.
- The taller the bar, the more instruments were sold that year. The tallest bar is the year that sold the most drum sets.
- The tallest bar was over year 4, so the most drum sets were sold that year.

Type in 4.

2) Assistment #368388 "368388 - Bar Graphs-Lost Pies-With Numbers"

There was a pie eating contest at a local fair that three brothers, Ted, Tim, and Tom, competed against each other in. The number of pies they ate is shown in the bar graph:



Who lost the contest?

Multiple choice:

- ✓ Ted
- ✗ Tim
- ✗ Tom

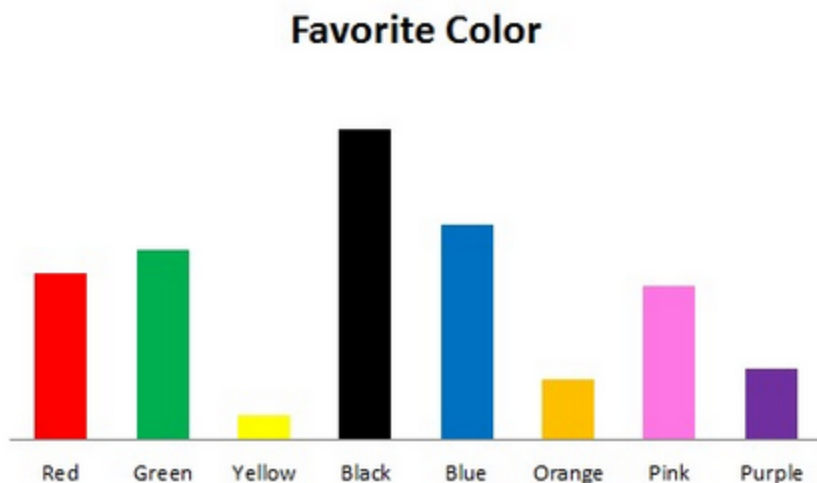
Hints:

- The person who ate the fewest pies lost the contest.
- The smallest bar will be the fewest pies eaten.
- The smallest bar was over Ted, so Ted ate the fewest pies and lost the contest.

Choose Ted.

3) Assistent #368403 "368403 - Bar Graph-Greatest-No Numbers"

A group of students answered a survey. The survey asked the students about what their favorite color was. The results are shown in a bar graph below:



What category had the greatest number of positive responses?

Fill in:

- ✓ Black
- ✓ black

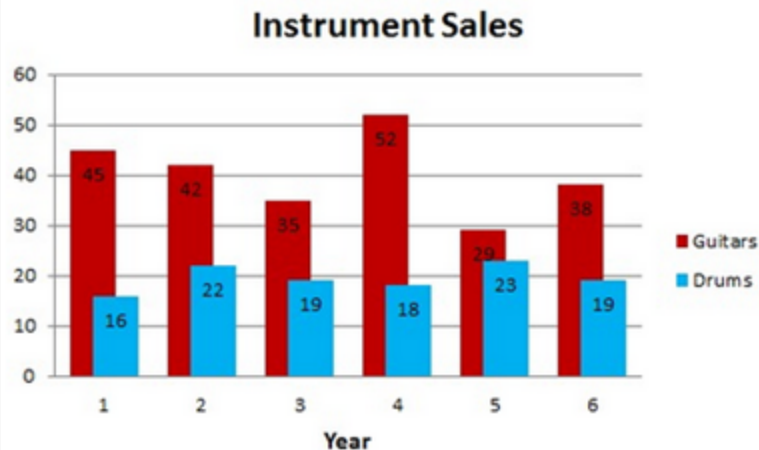
Hints:

- The tallest bar has the greatest number of positive responses.
- The greatest number of positive responses was Black.

Type in Black.

4) Assistent #368418 "368418 - Instrument sales per year - Value"

A young musician, Cameron, decided to open his own music store to sell instruments and teach lessons. He plotted the first six years sales of his highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many drum sets did he sell in the 4th year?

Algebra:

✓ 18

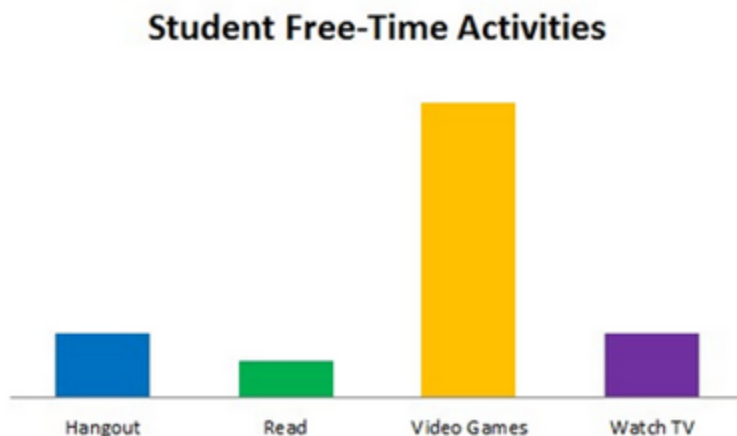
Hints:

- The question is asking about drum sets, so the columns you're focusing on are the blue bars.
- Find the column corresponding to the 4th year and find the value of the blue bar.
- The number of drum sets he sold in the 4th was 18.

Type in 18.

5) Assistent #368433 "368433 - Bar Graph-Lowest-No Numbers"

A group of students answered a survey. The survey asked the students about what they did in their free-time. The results are shown in a bar graph below:



What category had the lowest number of positive responses?

Fill in:

✓ Read

✓ read

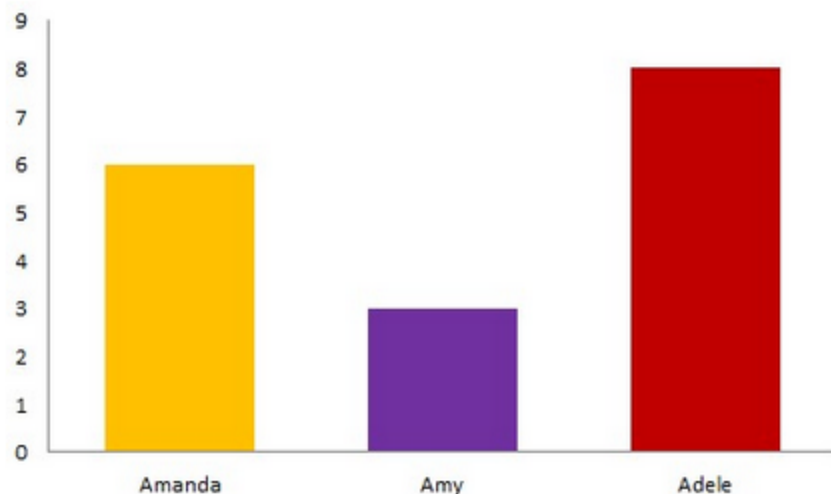
Hints:

- The shortest bar has the lowest number of positive responses.
- The lowest number of positive responses was Read.

Type in Read.

6) Assisment #368448 "368448 - Bar Graphs-Won Pies-With Numbers"

There was a pie eating contest at a local fair that three sisters, Amanda, Amy, and Adele, competed against each other in. The number of pies they ate is shown in the bar graph:



Who won the contest?

Multiple choice:

- ✓ Adele
- ✗ Amanda
- ✗ Amy
- ✗ It was a tie

Hints:

- The person who ate the most pies won the contest.
- The taller the bar, the more pies that person ate. So the tallest bar won.
- The tallest bar was over Adele, so Adele ate the most pies and won the contest.

Choose Adele.

7) Assistentment #368463 "368463 - Insturment sales - differences"

A young musician, Amber, decided to open her own music store to sell instruments and teach lessons. She plotted the first six years sales of her highest grossing instruments, guitars and drum sets, on a bar graph, shown below.



How many more guitars than drum sets did she sell in the 6th year?

Algebra:

✓ 27

Hints:

- She sold 42 guitars and 15 drum sets in the 6th year.
- There are more guitars than drum sets, so subtract.

$$42 - 15$$

- There are 27 more guitars than drum sets.

Type in 27.

Appendix B.3.1: Scale Factor Skill Documentation

| Skill | Common Core State Standard |
|--------------|----------------------------|
| Scale Factor | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 85626 | 6 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

365381

365394

365373

363461

368302

368301

365381

Assistment ID: 375202

[Comment on this question](#)

Matt was looking at directions to different places around his area on a map, and he wrote down the distance to various places from his house in a table. He recorded both the distance on the map and the corresponding distance he'd have to walk:

| Location | Map Distance (inches) | Actual Distance (miles) |
|-----------------|-----------------------|-------------------------|
| Post Office | 2.5 | 15 |
| Library | 3 | 18 |
| School | 1.25 | 7.5 |
| Doctor's Office | 1 | 6 |
| Grocery Store | 2 | 12 |

What's the scale factor from the number of inches to the number of miles?

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Students are asked for the scale factor given a set of data
- Type: Algebra
- Data changes

365394

Assistment ID: 375245

[Comment on this question](#)

Matt is making a map for homework, and he's mapping various places in his area. He recorded the distance the places are from his house and he scaled the distance down for the map, and he put it all in the following table:

| Location | Map Distance (inches) | Actual Distance (miles) |
|-----------------|-----------------------|-------------------------|
| Post Office | 2.5 | 5 |
| Library | 3 | 6 |
| School | 1.25 | 2.5 |
| Doctor's Office | 1 | 2 |
| Grocery Store | 2 | 4 |

What's the scale factor in number of miles to number of inches?

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Students are asked for the scale factor given a set of data
- Type: Algebra
- Data changes

365373

Assistment ID: 375268 [Comment on this question](#)

Martha wants to bake cookies, but she isn't baking for a group, just for a snack for herself. So she used a scale factor to scale the recipe down so it won't make as many cookies. She listed the recipe and the scaled down amounts in a table below:

| Ingredient | Full Recipe | Scaled down recipe |
|------------------------|-------------|--------------------|
| Butter (cups) | 1 | 0.8 |
| White Sugar (cups) | 1 | 0.8 |
| Brown Sugar (cups) | 1 | 0.8 |
| Eggs | 2 | 1.6 |
| Vanilla Extract (tsp) | 2 | 1.6 |
| Flour (cups) | 3 | 2.4 |
| Baking Soda (tsp) | 1 | 0.8 |
| Hot Water (tsp) | 2 | 1.6 |
| Salt (tsp) | 1/2 | 0.4 |
| Chocolate Chips (cups) | 2 | 1.6 |

What is the scale factor she used to go from the full recipe to the scaled down recipe?

Type your answer below (mathematical expression):

- This is a variabilized template
- Students are asked for the scale factor given data
- Type: Algebra
- Data changes

363461

Assistment ID: 375312 [Comment on this question](#)

Bill wanted to make a cake, and he wanted it to be a multilayer cake. So he used a scale factor to scale his recipe up to make all the batter at once, and he organized it into this table:

| Ingredient | Single Layer | Bill's Measurements |
|------------|--------------|---------------------|
| Cocoa | 1/3 cup | 1 1/3 cups |
| Eggs | 2 | 8 |
| Flour | 1 1/2 cups | 6 cups |
| Sugar | 1 cup | 4 cups |
| Butter | 1 1/2 sticks | 6 sticks |

How many layers will Bill's cake be?

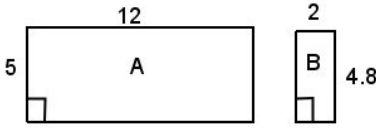
Type your answer below (mathematical expression):

- This is a variabilized template
- Students are asked for the layers (which is the scale factor) given a set of data
- Type: Algebra
- Data changes

368301 & 368302

Assistment ID: 375224 [Comment on this question](#)

Parallelogram A and B are similar. What is the scale factor from rectangle B to A?



Type your answer below (mathematical expression):

- This is a variabilized template
- Students are asked for the scale factor given a picture of similar figures
- Type: Algebra
- Image changes
- 368301 asks for A to B, 368302 asks for B to A

Appendix B.3.2: Scale Factor Skill Sample Problem Print

Problem Set "Scale Factor Skill - sample assistments" id:[154708]

1) Assistment #375221 "375221 - Assistment #365381"

Matt was looking at directions to different places around his area on a map, and he wrote down the distance to various places from his house in a table. He recorded both the distance on the map and the corresponding distance he'd have to walk:

| Location | Map Distance (inches) | Actual Distance (miles) |
|-----------------|-----------------------|-------------------------|
| Post Office | 2.5 | 2.5 |
| Library | 3 | 3 |
| School | 1.25 | 1.25 |
| Doctor's Office | 1 | 1 |
| Grocery Store | 2 | 2 |

What's the scale factor from the number of inches to the number of miles?

Algebra:

✓ 1

Hints:

- The actual distance in miles divided by the map distance in inches is the scale factor.
- Take one of the actual distances divided by it's map distance.

Ex.

$$\frac{\text{Actual library: } 3}{\text{Map Library: } 3} = 1$$

So the scale factor is 1

Type in 1

2) Assistment #375261 "375261 - Assistment #365394"

Matt is making a map for homework, and he's mapping various places in his area. He recorded the distance the places are from his house and he scaled the distance down for the map, and he put it all in the following table:

| Location | Map Distance (inches) | Actual Distance (miles) |
|-----------------|-----------------------|-------------------------|
| Post Office | 2.5 | 15 |
| Library | 3 | 18 |
| School | 1.25 | 7.5 |
| Doctor's Office | 1 | 6 |
| Grocery Store | 2 | 12 |

What's the scale factor in number of miles to number of inches?

Algebra:

✓ 0.166666666666667

Hints:

- The map distance in inches divided by the actual distance in miles is the scale factor.
- Take one of the actual distances divided by it's map distance.

Ex.

$$\frac{\text{Map library: } 3}{\text{Actual Library: } 18} = 0.166666666666667$$

So the scale factor is 0.166666666666667

Type in 0.166666666666667.

3) Assistentment #375281 "375281 - Assistentment #365373"

Martha wants to bake cookies, but she isn't baking for a group, just for a snack for herself. So she used a scale factor to scale the recipe down so it won't make as many cookies. She listed the recipe and the scaled down amounts in a table below:

| Ingredient | Full Recipe | Scaled down recipe |
|------------------------|-------------|--------------------|
| Butter (cups) | 1 | 0.2 |
| White Sugar (cups) | 1 | 0.2 |
| Brown Sugar (cups) | 1 | 0.2 |
| Eggs | 2 | 0.4 |
| Vanilla Extract (tsp) | 2 | 0.4 |
| Flour (cups) | 3 | 0.6 |
| Baking Soda (tsp) | 1 | 0.2 |
| Hot Water (tsp) | 2 | 0.4 |
| Salt (tsp) | 1/2 | 0.1 |
| Chocolate Chips (cups) | 2 | 0.4 |

What is the scale factor she used to go from the full recipe to the scaled down recipe?

Algebra:

✓ 0.2

Hints:

- Choose a category where the Full Recipe number is 1 to make the calculation simpler.
- Divide the Scaled Down Recipe by the Full Recipe to find the scale factor.
- The scale factor is 0.2.

Type in 0.2.

4) Assistentment #375321 "375321 - Assistentment #363461"

Bill wanted to make a cake, and he wanted it to be a multilayer cake. So he used a scale factor to scale his recipe up to make all the batter at once, and he organized it into this table:

| Ingredient | Single Layer | Bill's Measurements |
|------------|--------------|---------------------|
| Cocoa | 1/3 cup | 2 2/3 cups |
| Eggs | 2 | 16 |
| Flour | 1 1/2 cups | 12 cups |
| Sugar | 1 cup | 8 cups |
| Butter | 1 1/2 sticks | 12 sticks |

How many layers will Bill's cake be?

Algebra:

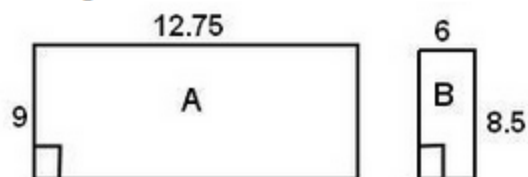
✓ 8

Hints:

- Because all of the ingredients are scaled up by the same factor, look at the measurements with integer values.
 - Divide "Bill's Measurement" by the "Single Layer" to find the scale factor.
-

5) Assistentment #375241 "375241 - 25710 - Stretching_and_Shrinking_Inv_4_2_a_Worked"

Parallelogram A and B are similar. What is the scale factor from rectangle B to A?



Algebra:

✓ 1.5

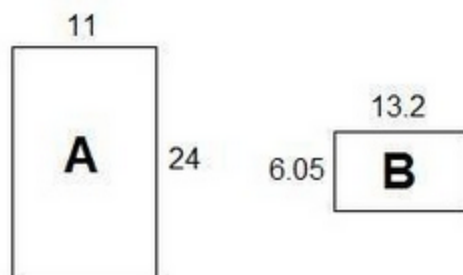
Hints:

- Look at the value of the corresponding sides of the figures, then divide the length of A by the length of B.
- The scale factor is 1.5.

Type in 1.5.

6) Assistentment #375301 "375301 - 25710 - Stretching_and_Shrinking_Inv_4_2_a_Worked"

Parallelogram A and B are similar. What is the scale factor from rectangle A to B?



(Image is not to scale.)

Algebra:

✓ 0.55

Hints:

- Compare the corresponding sides of the figures. Divide the length of B by the length of A.
- The scale factor is 0.55.

Type in 0.55.

Appendix B.4.1: Writing Equations Skill Documentation

| Skill | Common Core State Standard |
|-------------------|----------------------------|
| Writing Equations | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 118292 | 6 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:

380308

375465

375531

375532

375609

375610

380308

Assistment ID: 389529

[Comment on this question](#)

Derek is traveling to a relative's house, which is 49 miles away. Write an equation for Derek's speed S if it takes him H hours to get there.

Write the equation in the form of $S =$ _____.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 3

- This is a variabilized template
- Students are asked for a speed, which will be found by dividing miles over hours
- The question is Algebra, so it will expect the expression
- The name and distance change

375465

Assistment ID: 389548

[Comment on this question](#)

Barbara makes \$18.1 dollars per hour at her job, which she's saving up for a vacation. Write an equation for ' y ', how much Barbara will make for the amount of time ' t ' she works.

Write the equation in the form of $y =$ _____.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Student is asked for expression relating amount made for working with time given the rate
- The question is type Algebra, so it will expect the expression
- The name and rate change

375531

Assistment ID: 389563

[Comment on this question](#)

Bert's electricity company charges customers for how much electricity they use based on whether the customer's power lines are up on poles or underground. The rate for power lines on poles is \$48.46 per watt, and the rate for power lines underground is \$13.11 per watt.

If Bert is using power lines on poles, write an equation for what he owes 'y' for how many watts of power he uses 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Student is asked for an expression involving rate and an amount
- The question is type Algebra
- The name and rates for power change

375532

Assistment ID: 389583

[Comment on this question](#)

Jack's electricity company charges customers for how much electricity they use based on whether the customer's power lines are up on poles or underground. The rate for power lines on poles is \$17.8 per watt, and the rate for power lines underground is \$7.08 per watt.

If Jack is using power lines underground, write an equation for what he owes 'y' for how many watts of power he uses 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Student is asked for an expression involving rate and an amount
- The question is type Algebra
- The name and rates for power change

375609

Assistment ID: 389600

[Comment on this question](#)

Carol is making an amplifier for her guitar to make the small sound coming from the guitar louder. If she wants the sound going out to be 3 times louder than the sound going in. Write an equation for the sound out 'y' from the sound from the guitar going in 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Student is asked for an expression for scaling up a sound x
- The question is type Algebra
- The name and magnitude change

375610

Assistment ID: 389614

[Comment on this question](#)

Athena runs an M&M's factory and is reviewing the bagging machines. They drop M&M's into bags on a conveyor belt, with 47 M&M's going into each bag. Write an equation for the number of bags 'B' that can be filled from a supply of M&M's 'T'.

Write your equation in the form of $B = \underline{\hspace{2cm}}$.

Type your answer below (mathematical expression):

Submit Answer

Show hint 1 of 2

- This is a variabilized template
- Students are asked for an expression for something based on the other variable, given a rate between them
- The question is type Algebra
- The name and number of candy per bag change

Appendix B.4.2: Writing Equations Skill Sample Problem Print

Problem Set "Writing Equations Skill - sample assistments" id:[154709]

1) Assistment #389543 "389543 - Assistment #380308"

Harry is traveling to a relative's house, which is 63 miles away. Write an equation for Harry's speed S if it takes him H hours to get there.

Write the equation in the form of $S = \underline{\hspace{2cm}}$.

Algebra:

✓ $63/H$

Hints:

- It may help to remember that distance = speed*time

$$d = s * t$$

$$\text{so } s = d/t$$

- If it takes Harry 2 hours to get there, then his speed is $63/2$, and if it takes 5 hours then his speed is $63/5$. What's Harry's speed if it takes him H hours?
- The equation for speed S is $S = 63/H$.

Type in $63/H$.

2) Assistment #389558 "389558 - Assistment #375465"

Barbara makes \$16.8 dollars per hour at her job, which she's saving up for a vacation. Write an equation for 'y', how much Barbara will make for the amount of time 't' she works.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Algebra:

✓ $16.8 * t$

Hints:

- If Barbara works for 2 hours, she'll make $2 * 16.8$ dollars, if she works for 3 hours she'll make $3 * 16.8$ dollars, and so on. So how much will she make for working 't' hours?
- The equation to find y in dollars is $y = 16.8 * t$.

Type in $16.8 * t$.

3) Assistment #389573 "389573 - Assistment #375531"

Jack's electricity company charges customers for how much electricity they use based on whether the customer's power lines are up on poles or underground. The rate for power lines on poles is \$24.98 per watt, and the rate for power lines underground is \$32.25 per watt.

If Jack is using power lines on poles, write an equation for what he owes 'y' for how many watts of power he uses 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Algebra:

✓ $24.98 * x$

Hints:

- If 2 watts of power are used, it will cost Jack $2 * 24.98$ dollars, and if Jack uses 4 watts, he'll owe $4 * 24.98$ dollars. So how much will he owe for using 'x' watts?
- The equation to find y in dollars is $y = 24.98 * x$.

Type in $24.98 * x$.

4) Assistentment #389588 "389588 - Assistentment #375532"

Bert's electricity company charges customers for how much electricity they use based on whether the customer's power lines are up on poles or underground. The rate for power lines on poles is \$50.49 per watt, and the rate for power lines underground is \$31.94 per watt.

If Bert is using power lines underground, write an equation for what he owes 'y' for how many watts of power he uses 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Algebra:

✓ $31.94 * x$

Hints:

- If 2 watts of power are used, it will cost Bert $2 * 31.94$ dollars, and if Bert uses 4 watts, he'll owe $4 * 31.94$ dollars. So how much will he owe for using 'x' watts?
- The equation to find y in dollars is $y = 31.94 * x$.

Type in $31.94 * x$.

5) Assistentment #389603 "389603 - Assistentment #375609"

Dylan is making an amplifier for his guitar to make the small sound coming from the guitar louder. If he wants the sound going out to be 4 times louder than the sound going in. Write an equation for the sound out 'y' from the sound from the guitar going in 'x'.

Write the equation in the form of $y = \underline{\hspace{2cm}}$.

Algebra:

✓ $4 * x$

Hints:

- If the amplifier is 3 times louder than the guitar, the loudness will be $3 * 4$, and if it's 7 times louder the loudness will be $7 * 4$. So how loud will the sound of the amplifier be when the guitar is 'x' loud?
- The equation to find y is $y = 4 * x$.

Type in $4 * x$.

6) Assistentment #389618 "389618 - Assistentment #375610"

Rita runs an M&M's factory and is reviewing the bagging machines. They drop M&M's into bags on a conveyor belt, with 35 M&M's going into each bag. Write an equation for the number of bags 'B' that can be filled from a supply of M&M's 'T'.

Write your equation in the form of $B = \underline{\hspace{2cm}}$.

Algebra:

✓ $T / 35$

Hints:

- If the supply of M&M's is 200, then the number of bags will be $200 / 35$, or if the supply is 500 then the number of bags is $500 / 35$. So how many bags will there be from a supply of 'T'?
- The equations to find B is

$$B = \frac{T}{35}$$

Type in $T / 35$

Appendix B.5.1: Parallel and Perpendicular Lines Skill Documentation

| Skill | Common Core State Standard |
|----------------------------------|----------------------------|
| Parallel and Perpendicular Lines | |

| | |
|---------------------|---------------------|
| Mastery Problem Set | Number of Templates |
| 95443 | 2 |
| Number to Master | Number of Attempts |
| 3 in-a-row | |

Assistment Templates:


375331

375332

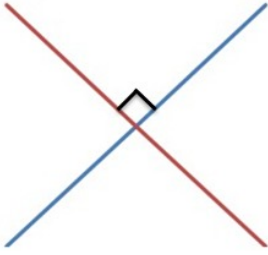
375331 & 375332

Assistment ID: 382200 [Comment on this question](#)

A



B



Which of the images above shows parallel lines?

Select one:

☒ B

☐ A

☐ Neither

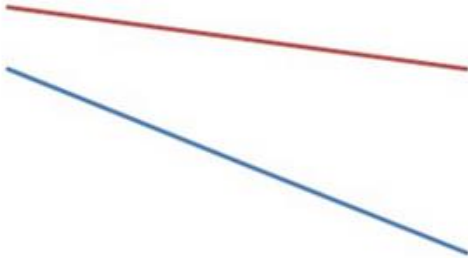
- This is a variabilized template
- Students are asked to determine parallel and perpendicular lines based on images
- Type: Multiple Choice
- The images change
- 375331 asks for which is parallel, 375332 asks for which is perpendicular

Appendix B.5.2: Parallel and Perpendicular Lines Skill Sample Problem Print

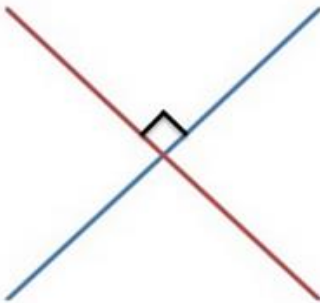
Problem Set "Parallel and Perpendicular Lines Skill - sample assistments" id:[154710]

1) Assistment #382224 "382224 - Assistment #375332"

A



B



Which of the images above shows perpendicular lines?

Multiple choice:

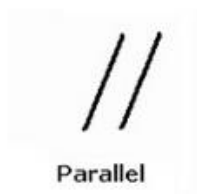
☒ B

☐ Neither

☐ A

Hints:

- The following are the definitions of parallel and perpendicular lines.



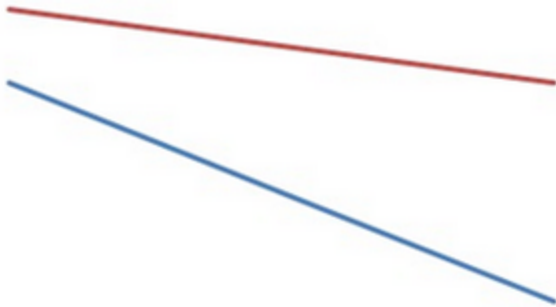
Which of the images looks like the perpendicular image here?

- B shows perpendicular lines.

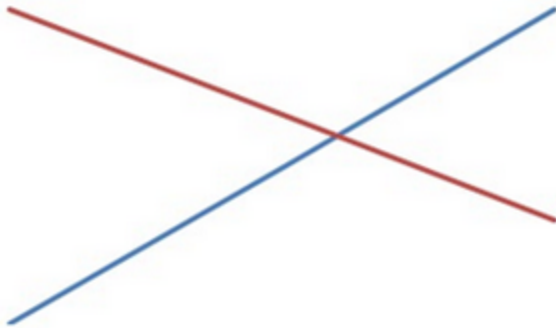
Choose B.

2) Assistentment #382203 "382203 - Assistentment #375331"

A



B



Which of the images above shows parallel lines?

Multiple choice:

✓ Neither

✗ A

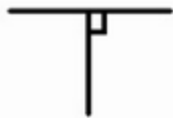
✗ B

Hints:

- The following are the definitions of parallel and perpendicular lines.



Parallel



Perpendicular

Which of the images looks like the parallel image here?

- Neither shows parallel lines.

Choose Neither.


Appendix C: Pre Test Data Spreadsheet

| Excluded | Section | Teacher | Group | StudentName | #244872 A | #389529 | #389529 A | Average | Std. Deviation |
|----------|---------|---------|-------|-------------|-----------|---------|-----------|----------|----------------|
| A | A | A | A | Student 1 | 16 | | 0 h/49 | 64.28571 | 242.8740091 |
| A | B | A | A | Student 2 | 1 | | 0 h+4 | 28.57143 | 405.2116714 |
| A | C | A | A | Student 3 | 16 | | 0 49h | 42.85714 | 34.15415753 |
| A | B | A | A | Student 4 | 16 | | 0 H/49 | 78.57143 | 892.2246585 |
| A | A | A | A | Student 5 | 16 | | 0 49h | 71.42857 | 516.5289256 |
| A | A | A | A | Student 6 | 16 | | 1 49/h | 71.42857 | 516.5289256 |
| A | B | A | A | Student 7 | 16 | | 0 49h | 57.14286 | 71.25990892 |
| A | B | A | A | Student 8 | 2 | | 1 49/h | 35.71429 | 168.6625063 |
| A | A | A | A | Student 9 | 20 | | 0 49* h | 35.71429 | 168.6625063 |
| A | B | A | A | Student 10 | 16 | | 0 h/49 | 64.28571 | 242.8740091 |
| A | B | A | A | Student 11 | 16 | | 0 49* H | 42.85714 | 34.15415753 |
| A | B | A | A | Student 12 | 16 | | 0 h/49 | 42.85714 | 34.15415753 |
| A | C | A | A | Student 13 | 16 | | 0 h2 | 35.71429 | 168.6625063 |
| A | C | A | A | Student 14 | 16 | | 0 5h | 35.71429 | 168.6625063 |
| A | A | A | A | Student 15 | 16 | | 0 h+49 | 42.85714 | 34.15415753 |
| A | A | A | A | Student 16 | 16 | | 0 h49 | 50 | 1.686625063 |
| A | B | A | A | Student 17 | 16 | | 0 45H | 64.28571 | 242.8740091 |
| A | A | A | A | Student 18 | 16 | | 0 H*49 | 21.42857 | 743.8016529 |
| A | A | A | A | Student 19 | y=4 | | 0 H49 | 35.71429 | 168.6625063 |
| A | B | A | A | Student 20 | 16 | | 0 49h | 35.71429 | 168.6625063 |
| A | C | A | A | Student 21 | 16 | | 0 H49 | 57.14286 | 71.25990892 |
| A | A | A | A | Student 22 | 16 | | 0 49h | 57.14286 | 71.25990892 |
| A | D | B | A | Student 23 | 16 | | 0 h(49) | 42.85714 | 81.40652383 |
| A | D | B | A | Student 24 | 34 | | 0 49h | 42.85714 | 81.40652383 |
| A | D | B | A | Student 25 | y = 16 | | 1 49/h | 50 | 3.533269263 |
| A | D | B | A | Student 26 | 16 | | 0 h*49 | 71.42857 | 382.1584035 |
| A | D | B | A | Student 27 | 36 | | 1 49/h | 71.42857 | 382.1584035 |
| A | D | B | A | Student 28 | 4 | | 0 H*49 | 35.71429 | 261.3205947 |
| A | A | B | A | Student 29 | 16 | | 0 H | 28.57143 | 543.2754819 |
| A | D | B | A | Student 30 | 16 | | 0 49h | 50 | 3.533269263 |
| A | B | B | A | Student 31 | 8 | | 0 h*49 | 50 | 3.533269263 |
| A | B | B | A | Student 32 | 16 | | 1 49/h | 71.42857 | 382.1584035 |
| A | A | B | A | Student 33 | 16 | | 0 49h | 57.14286 | 27.70083102 |
| A | D | B | A | Student 34 | 72/1 | | 0 6h | 50 | 3.533269263 |
| A | B | B | A | Student 35 | 16 | | 0 49h | 78.57143 | 712.4484143 |
| A | B | B | A | Student 36 | 16 | | 0 h | 28.57143 | 543.2754819 |
| A | D | B | A | Student 37 | 20 | | 0 49h | 50 | 3.533269263 |
| A | A | B | A | Student 38 | 16 | | 0 h*49 | 64.28571 | 153.9092091 |
| A | A | B | A | Student 39 | 8 | | 1 49/h | 42.85714 | 81.40652383 |
| A | B | B | A | Student 40 | 4.5 | | 0 h/49 | 28.57143 | 543.2754819 |
| A | A | B | A | Student 41 | 16 | | 0 H/49 | 71.42857 | 382.1584035 |
| A | A | A | B | Student 42 | 16 | | 0 h(49) | 78.57143 | 1033.163265 |
| A | C | A | B | Student 43 | 16 | | 0 h | 71.42857 | 625 |
| A | A | A | B | Student 44 | 16 | | 0 h67 | 50 | 12.75510204 |
| A | C | A | B | Student 45 | 8 | | 0 h | 35.71429 | 114.7959184 |
| A | B | A | B | Student 46 | 32 | | 0 h | 57.14286 | 114.7959184 |
| A | A | A | B | Student 47 | 24 | | 0 49H | 28.57143 | 318.877551 |
| A | A | A | B | Student 48 | 16 | | 0 49h | 71.42857 | 625 |
| A | C | A | B | Student 49 | 16 | | 0 h1 | 42.85714 | 12.75510204 |
| A | C | A | B | Student 50 | 18 | | 0 H | 28.57143 | 318.877551 |
| A | C | A | B | Student 51 | 16 | | 0 h49 | 42.85714 | 12.75510204 |
| A | C | A | B | Student 52 | 16 | | 0 H/49 | 57.14286 | 114.7959184 |
| A | C | A | B | Student 53 | 16 | | 0 h | 64.28571 | 318.877551 |
| A | C | A | B | Student 54 | 1 | | 0 49H | 42.85714 | 12.75510204 |
| A | A | A | B | Student 55 | 16 | | 0 H * 49 | 50 | 12.75510204 |
| A | C | A | B | Student 56 | 16 | | 0 H49 | 28.57143 | 318.877551 |
| A | C | A | B | Student 57 | 2 | | 0 49 * H | 7.142857 | 1543.367347 |
| A | B | A | B | Student 58 | 4 | | 0 H(49) | 42.85714 | 12.75510204 |
| A | A | A | B | Student 59 | 44/18 | | 0 H | 35.71429 | 114.7959184 |
| A | A | B | B | Student 60 | 16 | | 0 49h | 50 | 0.565323082 |
| A | D | B | B | Student 61 | 16 | | 0 h49 | 42.85714 | 62.32686981 |
| A | B | B | B | Student 62 | 18 | | 0 H | 28.57143 | 491.9724122 |
| A | A | B | B | Student 63 | 16 | | 0 H49 | 78.57143 | 773.9272995 |
| A | B | B | B | Student 64 | 16 | | 0 h*49 | 42.85714 | 62.32686981 |
| A | A | B | B | Student 65 | 16 | | 0 h2 | 57.14286 | 40.84459268 |
| A | A | B | B | Student 66 | 16 | | 0 H | 71.42857 | 427.5255809 |
| A | B | B | B | Student 67 | 16 | | 0 49 h | 57.14286 | 40.84459268 |
| A | A | B | B | Student 68 | 16 | | 0 49h | 57.14286 | 40.84459268 |
| A | D | B | B | Student 69 | 16 | | 0 H 49 | 50 | 0.565323082 |
| A | D | B | B | Student 70 | 16 | | 1 49/h | 50 | 0.565323082 |
| A | A | B | B | Student 71 | 28 | | 0 h49 | 64.28571 | 183.1646786 |

| | | | | | | | | |
|------------------------|---|----------|----------|-------------|-----------|----------|----------|-----------------------------|
| A | A | B | B | Student 72 | ? | 0 H | 21.42857 | 859.8564079 |
| A | D | B | B | Student 73 | 16 | 0 49* h | 42.85714 | 62.32686981 |
| A | D | B | B | Student 74 | 20 | 0 h*49 | 42.85714 | 62.32686981 |
| A | B | B | B | Student 75 | 16 | 0 h/49 | 42.85714 | 62.32686981 |
| A | B | B | B | Student 76 | 18 | 0 h49 | 21.42857 | 859.8564079 |
| A | D | B | B | Student 77 | 16 | 0 H*49 | 71.42857 | 427.5255809 |
| A | A | B | B | Student 78 | 16 | 0 h12.25 | 71.42857 | 427.5255809 |
| | | | | | | | Group | Teacher |
| | | | | | | | A to B | A to B |
| | | | | | | | 50.17422 | 47.67857143 Expr Average |
| | | | | | | | 48.64865 | 51.31578947 Control Average |
| | | | | | | | 15.68892 | 16.68399152 Expr Stdev |
| | | | | | | | 17.23831 | 16.00255626 Control Stdev |
| | | | | | | | 0.685036 | 0.328849582 Ttest |
| | | | | | | | 0.088499 | -0.227289815 Effect Size |
| Descriptive Statistics | | | | | | | | |
| | | Group A | Group B | Teacher A | Teacher B | | | |
| Mean | | 50.17422 | 48.64865 | 47.67857143 | 51.31579 | | | |
| Standard Deviation | | 15.68892 | 17.23831 | 16.68399152 | 16.00256 | | | |
| #students | | 41 | 37 | 40 | 38 | | | |
| Max | | 78.57143 | 78.57143 | 78.57142857 | 78.57143 | | | |
| Min | | 21.42857 | 7.142857 | 7.142857143 | 21.42857 | | | |
| Range | | 57.14286 | 71.42857 | 71.42857143 | 57.14286 | | | |

Appendix D: Powerpoint Advertisement for Study

Slide 1




The purpose of our study is to see if having students practice prior and prerequisite skills will help improve students' success within the Connected Mathematics 2 curriculum.

Half the class will be given off-topic practice, while the other half of the class will practice the proper prior and prerequisite skills for the current CMP2 unit.

The Problem Sets for the on-topic practice have been created based upon research done at the University of Chicago. This research tagged all of the skills studied in every 7th Grade unit.

[Go to Connected Math 2 Units](#)

Slide 2

 Connected Math 2 Units

Select the CMP2 unit you would like to view.

- Variables and Patterns
- Stretching and Shrinking
- Comparing and Scaling
- Accentuate the Negative
- Moving Straight Ahead
- Filling and Wrapping
- What Do You Expect?
- Data Distributions

Slide 3

ASSiSTments

Variables and Patterns

Click on the number to see the Problem Set.

Prerequisite Skills

Interpreting Data - [85018](#)
Ordering Decimals - [41300](#)
Tables - [84929](#)

Off-Topic Skills

Area Rectangle - [10710](#)
Properties and Classification Circle - [22457](#)
Properties and Classification Quadrilaterals - [85625](#)

[Return to CMP2 Unit List](#)

[Go to Stretching and Shrinking](#)

Slide 4

ASSiSTments

Stretching and Shrinking

Click on the number to see the Problem Set.

Prerequisite Skills

Percent Of - [37146](#)
Perimeter of a Polygon - [10766](#)
Area Irregular Figures - [10763](#)
Area Rectangle - [10710](#)
Properties and Classification Quadrilaterals - [85625](#)

Off-Topic Skills

Point Plotting - [35008](#)
Tables - [84929](#)
Mean - [19362](#)
Median - [21943](#)
Range - [8979](#)

[Return to CMP2 Unit List](#)

[Go to Comparing and Scaling](#)

Slide 5

ASSiSTments

Comparing and Scaling

Click on the number to see the Problem Set.

Prerequisite Skills

Conversion of Fractions Decimals
Percents - [40425](#)
Percent of a Number - [37146](#)
Equivalent Fractions - [39181](#)
Writing Equations - [118292](#)

Off-Topic Skills

Parallel and Perpendicular Lines - [95443](#)
Bar Graphs - [78955](#)
Commutative Property - [13718](#)
Distributive Property - [11901](#)

[Return to CMP2 Unit List](#)

[Go to Accentuate the Negative](#)

Slide 6

ASSiSTments

Accentuate the Negative

Click on the number to see the Problem Set.

Prerequisite Skills

Ordering Decimals - [41300](#)
Adding and Subtracting Fractions - [38743](#)
Adding and Subtracting Decimals - [37846](#)
Graphing Ordered Pairs - [35008](#)
Interpreting Coordinate Graphs - [85019](#)
Multiplication Fractions - [37091](#)
Division Fractions - [37276](#)
Multiplication and Division of
Decimals - [39659](#)


Off-Topic Skills

Counting Methods - [15528](#)
Area Rectangle - [10710](#)
Perimeter of a Polygon - [10766](#)
Area Irregular Figures - [10763](#)
Theoretical Probability - [8585](#)
Properties and Classification Circle - [22457](#)
Finding Fractions and Ratios - [35610](#)
Scale Factor - [85626](#)
Similar Figures - [96850](#)
Unit Conversion within a System - [9056](#)

[Return to CMP2 Unit List](#)

[Go to Moving Straight Ahead](#)

Slide 7



Moving Straight Ahead

Click on the number to see the Problem Set.

Prerequisite Skills

- Interpret Coordinate Graphs - [85019](#)
- Point Plotting - [35008](#)
- Interpreting Data - [85018](#)
- Multiplication and Division Decimals - [39659](#)
- Addition and Subtraction Integers - [11898](#)
- Commutative Property - [13718](#)
- Distributive Property - [11901](#)
- Multiplication and Division Integers - [11899](#)
- Parallel and Perpendicular Lines - [95443](#)
- Percent of Increase and Decrease - [34196](#)


Off-Topic Skills

- Counting Methods - [15528](#)
- Area Rectangle - [10710](#)
- Perimeter of a Polygon - [10766](#)
- Area Irregular Figures - [10763](#)
- Theoretical Probability - [8585](#)
- Properties and Classification Circle - [22457](#)
- Finding Fractions and Ratios - [35610](#)
- Scale Factor - [85626](#)
- Similar Figures - [96850](#)
- Unit Conversion within a System - [9056](#)
- Properties and Classification
- Quadrilaterals - [85625](#)

[Return to CMP2 Unit List](#)

[Go to Filling and Wrapping](#)

Slide 8



Filling and Wrapping

Click on the number to see the Problem Set.

Prerequisite Skills

- Multiplication and Division Decimals - [39659](#)
- Area Rectangle - [10710](#)
- Perimeter of a Polygon - [10766](#)
- Multiplication Fractions - [37091](#)
- Division Fractions - [37276](#)
- Properties and Classification Circle - [22457](#)
- Finding Fractions and Ratios - [35610](#)
- Scale Factor - [85626](#)
- Similar Figures - [96850](#)
- Unit Conversion within a System - [9056](#)

Off-Topic Skills

- Point Plotting - [35008](#)
- Tables - [84929](#)
- Mean - [19362](#)
- Median - [21943](#)
- Range - [8979](#)
- Line Plot - [85017](#)
- Bar Graphs - [78955](#)
- Tables - [84929](#)
- Parallel and Perpendicular Lines - [95443](#)
- Commutative Property - [13718](#)
- Distributive Property - [11901](#)

[Return to CMP2 Unit List](#)

[Go to What Do You Expect?](#)

Slide 9

ASSiSTments

What Do You Expect?

Click on the number to see the Problem Set.

Prerequisite Skills

Theoretical Probability - [8585](#)
Counting Methods - [15528](#)
Equally Likely and Unlikely Outcomes - [58512](#)
Mean - [31261](#)

Off-Topic Skills

Bar Graphs - [78955](#)
Range - [8979](#)
Line Plot - [85017](#)
Median - [21943](#)

[Return to CMP2 Unit List](#)

[Go to Data Distributions](#)

Slide 10

ASSiSTments

Data Distributions

Click on the number to see the Problem Set.

Prerequisite Skills

Bar Graphs - [78955](#)
Range - [8979](#)
Line Plot - [85017](#)
Mean - [19362](#)
Median - [21943](#)

Off-Topic Skills

Area Rectangle - [10710](#)
Similar Figures - [96850](#)
Counting Methods - [15528](#)
Perimeter of a Polygon - [10766](#)
Unit Conversion within a System - [9056](#)

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[Go to Problem Set Reasoning](#)

Slide 11

ASSiSTments

Problem Set Reasoning:
The problem sets used for the study should accurately represent the proper difficulty level for a 7th Grade student. Through the creation of 7th Grade difficulty problem sets, the study can provide useful results.

[Return to CMP2 Unit List](#)[Go to Purpose of Study](#)

Slide 12

ASSiSTments

Purpose of Study:
The overall goal of our study is to determine the usefulness of having students practice the prior and prerequisite skills relevant to a particular CMP2 unit, while the class is being taught the same unit. The data gathered through our study will help us understand if the prior and prerequisite problem sets have a beneficial impact on the learning process of students.

[Return to CMP2 Unit List](#)

Appendix E: CMP Test Questions Created by the Math Center

Appendix E.1: Variables and Patterns Test Questions

Problem Set "Pre-Test - Variables and Patterns A" id:[95212]

1) Assistentment #381948 "381948 - The first term in..."

The first term in a sequence of numbers is $\frac{1}{2}$. Each term after the first term is 1 more than twice its previous term. What is the 4th term?

- ☐ A. 2
- ☐ B. 4
- ☐ C. 5
- ☐ D. 11
- ☐ E. 23

2) Assistentment #381949 "381949 - If $y = 12 + 3.5x$,..."

If $y = 12 + 3.5x$, what is the value of y when $x = 10$?

- ☐ A. 25.5
- ☐ B. 155
- ☐ C. 47
- ☐ D. 362

3) Assistentment #386352 "386352 - Which rule shows ..."

An input-output table is below.

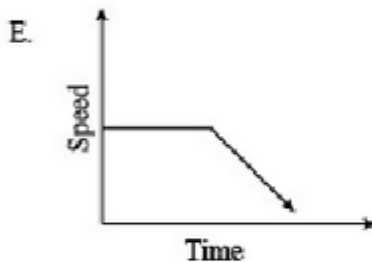
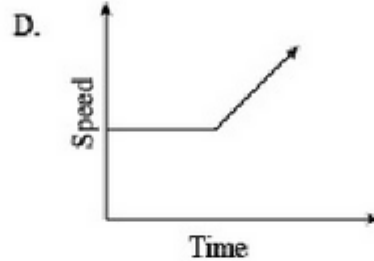
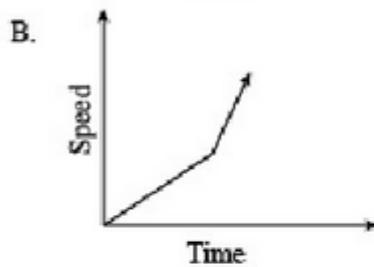
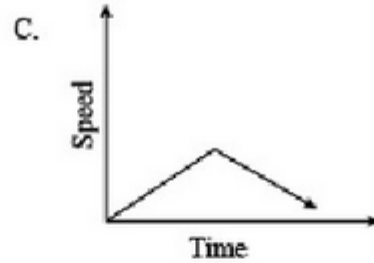
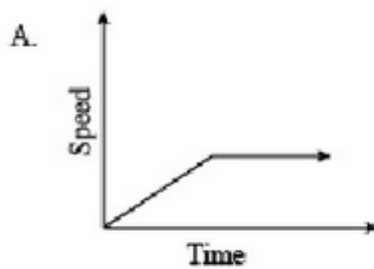
| Input | Output |
|-------|--------|
| -2 | -6 |
| -4 | -8 |
| -8 | -12 |
| -16 | -20 |

Which rule shows the relationship between the input number and the output number?

- ☐ A. add 4
- ☐ B. add -4
- ☐ C. multiply by 3
- ☐ D. multiply by -3

4) Assistentment #386353 "386353 - For two minutes, ..."

For two minutes, Casey runs at a constant speed. Then she gradually increases her speed. Which of the following graphs could show how her speed changed over time?



- ☐ A
- ☐ B
- ☐ C
- ☐ D
- ☐ E

5) Assistentment #386354 "386354 - Which of the foll..."

(2, 5), (4, 9), (6, 13)

Which of the following describes what to do to the first number in each ordered pair shown above to obtain the corresponding second number?

- ☐ A. Add 3
- ☐ B. Subtract 3
- ☐ C. Multiply by 2
- ☐ D. Multiply by 2 and subtract 1
- ☐ E. Multiply by 2 and add 1

6) Assisment #386355 "386355 - The data in the t..."

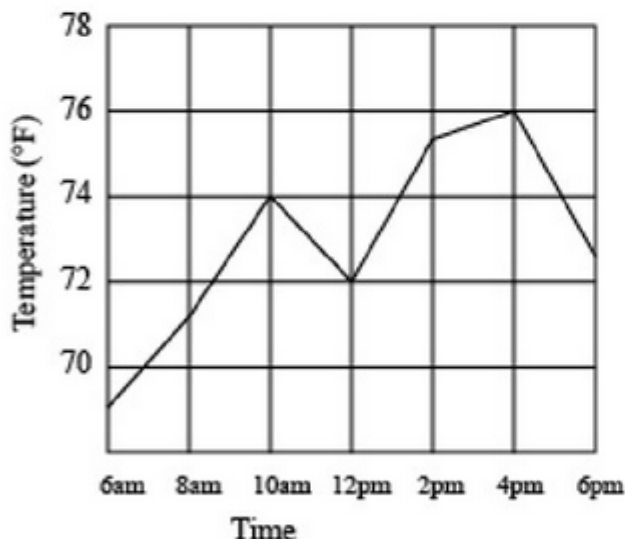
The data in the table show the cost of renting a bicycle by the hour, including a deposit.

| Renting a Bicycle | |
|-------------------|-------------------------|
| Hours (h) | Cost in dollars (c) |
| 2 | 15 |
| 5 | 30 |
| 8 | 45 |

If hours, h , were graphed on the horizontal axis and cost, c , were graphed on the vertical axis, what would be the equation of a line that fits the data?

- ☐ A. $c = 5h$
☐ B. $c = (1/5)h + 5$
☐ C. $c = 5h + 5$
☐ D. $c = 5h - 5$

7) Assisment #386356 "386356 - According to the ..."

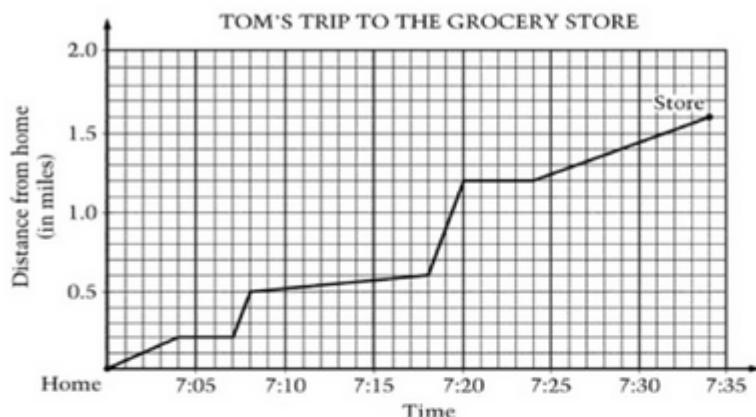


According to the graph above, the temperature at 10 a.m. is approximately how many degrees greater than the temperature at 8 a.m.?

- ☐ A. 1
☐ B. 1.5
☐ C. 2
☐ D. 2.5
☐ E. 3

8) Assistent #386405 "386405 - Tom went to the g..."

Tom went to the grocery store. The graph below shows Tom's distance from home during his trip.



Tom stopped twice to rest on his trip to the store. What is the total amount of time that he spent resting?

- ☐ A. 5 minutes
- ☐ B. 7 minutes
- ☐ C. 8 minutes
- ☐ D. 10 minutes
- ☐ E. 25 minutes

9) Assistent #386406 "386406 - The table shows h..."

| In | Out |
|----|-----|
| 2 | 5 |
| 3 | 7 |
| 4 | 9 |
| 5 | 11 |
| 15 | 31 |
| 38 | |

The table shows how the "In" numbers are related to the "Out" numbers. When 38 goes in, what number comes out?

- ☐ A. 41
- ☐ B. 51
- ☐ C. 54
- ☐ D. 77

10) Assistentment #392962 "392962 - Assistentment #392962"

Some ordered pairs for a linear function of x are given in the table below.

| x | y |
|-----|-----|
| 1 | 1 |
| 3 | 7 |
| 5 | 13 |
| 7 | 19 |

Which of the following equations was used to generate the table above?

- ☐ A. $y = 2x + 1$
- ☐ B. $y = 2x - 1$
- ☐ C. $y = 3x - 2$
- ☐ D. $y = 4x - 3$

Appendix E.2: Stretching and Shrinking Test Questions

Problem Set "Pre-Test - Stretching and Shrinking A" id:[95209]

1) Assistentment #381944 "381944 - Miranda enlarged ..."

Miranda enlarged a picture proportionally. Her original picture is 4cm wide and 6cm long. If the new, larger picture is 10cm wide, what is its length?

- ☐ A. 8cm
- ☐ B. 12cm
- ☐ C. 15cm
- ☐ D. 115cm

2) Assistentment #381945 "381945 - Tatenda has a cho..."

Tatenda has a chocolate chip cookie recipe that uses 2 cups of sugar for 6 dozen cookies. How much sugar will he need if he only wants to make 36 cookies?

- ☐ A. 1 cup
- ☐ B. 5 cups
- ☐ C. 2 cups
- ☐ D. 4 cups

3) Assistentment #381946 "381946 - Nora has two pict..."

Nora has two picture frames that have identical shapes but different sizes. The larger frame is 3ft wide by 6ft high. What is the measurement of the height of the other frame if it is 2ft wide?

- ☐ A. 3ft
- ☐ B. 4ft
- ☐ C. 9ft
- ☐ D. 1ft

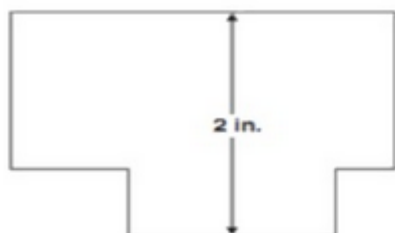
4) Assistentment #381947 "381947 - A certain map..."

A certain map uses a scale of 1 inch equals 25 miles. How many miles are represented by 5 inches on this map?

- ☐ A. 5
- ☐ B. 25
- ☐ C. 50
- ☐ D. 125

5) Assistentment #386479 "386479 - Mr. Craig made..."

Mr. Craig made a scale drawing of his office.



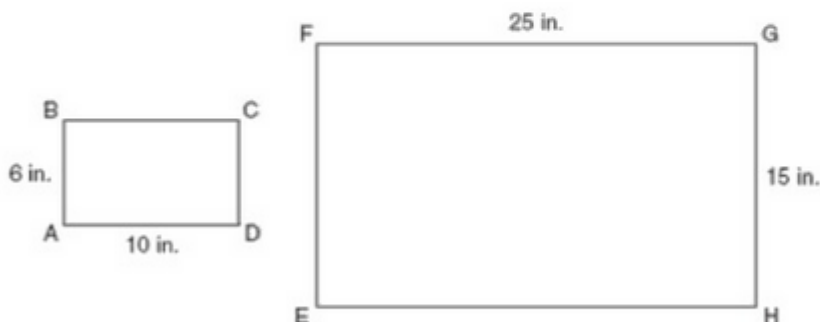
$$\frac{1}{2} \text{ inch} = 3 \text{ feet}$$

The width of the scale drawing of the office is two inches. What is the actual width, in feet, of Mr. Craig's office?

- ☐ A. 3
- ☐ B. 6
- ☐ C. 9
- ☐ D. 12

6) Assistentment #386480 "386480 - Rectangle ABCD..."

Rectangle ABCD is similar to rectangle EFGH.

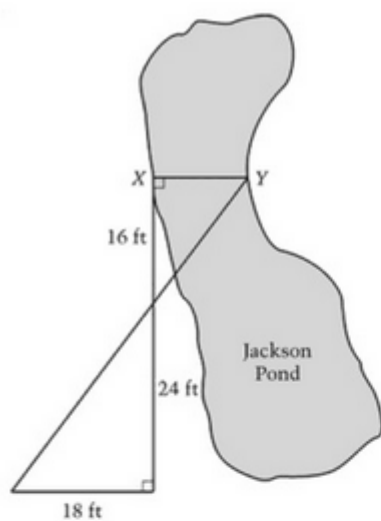


What is the scale factor from rectangle ABCD to rectangle EFGH?

- ☐ A. 1.5
- ☐ B. 2.5
- ☐ C. 5.0
- ☐ D. 19.0

7) Assistent #386481 "386481 - The figure below ..."

The figure below shows Jackson Pond.



What is the distance across Jackson Pond from point X to point Y?

- ☐ A. 8 feet
- ☐ B. 10 feet
- ☐ C. 12 feet
- ☐ D. 14 feet
- ☐ E. 22 feet

8) Assistent #386483 "386483 - If $\triangle XYZ$ is simil..."

If $\triangle XYZ$ is similar to $\triangle STU$, what is the length of XY in centimeters?

- ☐ A. 9
- ☐ B. 10.5
- ☐ C. 12
- ☐ D. 12.5

9) Assistent #381931 "381931 - Danielle is drawi..."

Danielle is drawing two similar triangles in the sand. The smaller triangle has side lengths of 3 feet, 2 feet, and 4 feet. Two corresponding sides of the second triangle are 6 feet and 4 feet in length. What is the length of the third side of the larger triangle?

- ☐ A. 4 feet
- ☐ B. 5 feet
- ☐ C. 6 feet
- ☐ D. 8 feet

10) Assistent #381929 "381929 - A dozen apples co..."

A dozen apples costs \$2.55. At this rate, how much would 8 apples cost?

- ☐ A. \$20.40
- ☐ B. \$3.83
- ☐ C. \$0.21
- ☐ D. \$1.70

Appendix E.3: Comparing and Scaling Test Questions

Problem Set "Pre-Test - Comparing and Scaling A" id:[93423]

1) Assistent #381039 "381039 - The table shows s..."

The table shows some values of x and y , where x is proportional to y .

| | | | |
|-----|---|-----|-----|
| x | 4 | 8 | Q |
| y | 9 | P | 45 |

What are the values of P and Q ?

- ☐ A. $P = 40$ and $Q = 13$
- ☐ B. $P = 18$ and $Q = 17$
- ☐ C. $P = 20$ and $Q = 18$
- ☐ D. $P = 40$ and $Q = 18$
- ☐ E. $P = 18$ and $Q = 20$

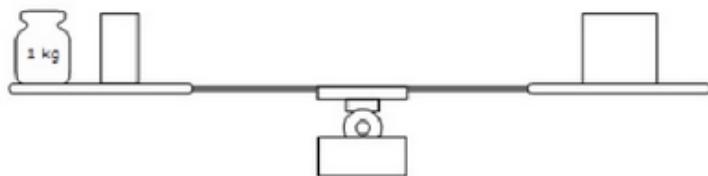
2) Assistent #381040 "381040 - The school carniv..."

The school carnival committee sold a total of 200 tickets for the grand prize drawing. Sue bought enough tickets so that she had a 20 percent chance of winning the grand prize. How many tickets did Sue buy?

- ☐ A. 20
- ☐ B. 40
- ☐ C. 160
- ☐ D. 400
- ☐ E. 1,000

3) Assistent #381041 "381041 - The objects on th..."

The objects on the scale make it balance exactly. On the left pan there is a 1kg weight (mass) and half a brick. On the right pan there is one brick.



What is the weight (mass) of one brick?

- ☐ A. 0.5kg
- ☐ B. 1kg
- ☐ C. 2kg
- ☐ D. 3kg

4) Assistent #381042 "381042 - Three brothers..."

Three brothers, Bob, Dan, and Mark, receive a gift of 45,000 zeds from their father. The money is shared between the brothers in proportion to the number of children each one has. Bob has 2 children, Dan has 3 children, and Mark has 4 children. How many zeds does Mark get?

- ☐ A. 5,000
- ☐ B. 10,000
- ☐ C. 15,000
- ☐ D. 20,000

5) Assistent #392961 "392961 - Assistent #392961"

If $\frac{2}{25} = \frac{n}{500}$, then $n =$

- ☐ A. 10
- ☐ B. 20
- ☐ C. 30
- ☐ D. 40
- ☐ E. 50

6) Assistent #381049 "381049 - Easy Ride Van Com..."

Easy Ride Van Company finds that about 40 percent of the time a person who makes an advance reservation for transportation does not keep the reservation. Therefore, for each of their 10-passenger vans, the Easy Ride Van Company schedules 13 persons on the basis of advance reservations. Based on the information above, about how many riders out of the 13 scheduled would not keep their reservations?

- ☐ A. 1
- ☐ B. 3
- ☐ C. 5
- ☐ D. 7
- ☐ E. 9

7) Assistent #381050 "381050 - Which size Dairy ..."

Which size Dairy Queen Blizzard gives you the best price per ounce?

Small 6 oz. cup for \$2.49

Medium 10 oz. cup for \$3.49

Large 16 oz. cup for \$4.99

Super Size 24 oz. cup for \$7.69

- ☐ A. Small
- ☐ B. Medium
- ☐ C. Large
- ☐ D. Super Size

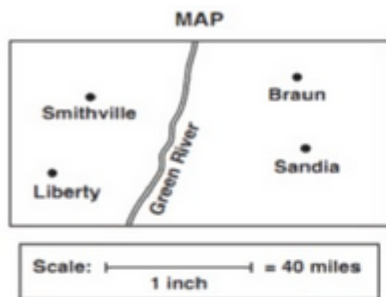
8) Assistent #381051 "381051 - Marie saved \$51. ..."

Marie saved \$51. On Wednesday, she spent \$8 of her savings. What ratio represents the portion of her total savings that she still has left?

- ☐ A. 43 : 8
 - ☐ B. 8 : 51
 - ☐ C. 43 : 51
 - ☐ D. 59 : 51
-

9) Assistent #381052 "381052 - Mr. Grey is plann..."

Mr. Grey is planning to fly an airplane from Smithville straight to Sandia.



The distance from Smithville to Sandia measures 1.5 inches on the map. What is the actual distance from Smithville to Sandia, in miles?

- ☐ A. 40
- ☐ B. 50
- ☐ C. 60
- ☐ D. 70

10) Assistent #381053 "381053 - A machine takes 2..."

A machine takes 2.8 hours to make 9 parts. At that rate, how many parts can the machine make in 28.0 hours?

- ☐ A. 226 parts
- ☐ B. 90 parts
- ☐ C. 81 parts
- ☐ D. 8 parts

Appendix E.4: Accentuate the Negative Test Questions

Problem Set "Pre-Test - Accentuate The Negative A" id:[94271]

1) Assistent #372747 "372747 - Choose the symbol..."

Choose the symbol that makes this number statement true.

$$-4 + (-10) \underline{\quad ? \quad} 12 + (-11)$$

- ☐ A. >
☐ B. <
☐ C. =

2) Assistent #372748 "372748 - The temperature o..."

The temperature on a mountain peak was 7 degrees Fahrenheit ($^{\circ}\text{F}$) at 6:00pm. By 8:00pm, the temperature had dropped to 0°F . If the temperature continued to drop at about the same rate, which is the BEST estimate of the temperature at 11:00pm?

- ☐ A. -20°F
☐ B. -14°F
☐ C. -10°F
☐ D. -9°F

3) Assistent #372749 "372749 - What are all the ..."

What are all the possible values of x such that $10|x| = 2.5$?

- ☐ A. 0.25 and -0.25
☐ B. 4 and -4
☐ C. 4.5 and -4.5
☐ D. 25 and -25

4) Assistent #372750 "372750 - Find the product...."

Find the product.

$$(-5)(-7) =$$

- ☐ A. -35
☐ B. -12
☐ C. -2
☐ D. 12
☐ E. 35

5) Assistent #372781 "372781 - If n is a negativ..."

If n is a negative integer, which of these is the largest number?

- ☐ A. $3 + n$
☐ B. $3 \times n$
☐ C. $3 - n$
☐ D. $3 \div n$

6) Assistent #392955 "392955 - Assistent #392955"

What is the order of the following set of numbers from greatest to least?

$$1\frac{1}{3}, \frac{2}{3}, \frac{-1}{3}, \frac{9}{5}$$

Select the letter with the correct order.

A. $-\frac{1}{3}, \frac{2}{3}, \frac{9}{5}, 1\frac{1}{3}$

B. $-\frac{1}{3}, 1\frac{1}{3}, \frac{2}{3}, \frac{9}{5}$

C. $\frac{9}{5}, \frac{2}{3}, 1\frac{1}{3}, -\frac{1}{3}$

D. $\frac{9}{5}, 1\frac{1}{3}, \frac{2}{3}, -\frac{1}{3}$

- ☐ A.
☐ B.
☐ C.
☐ D.

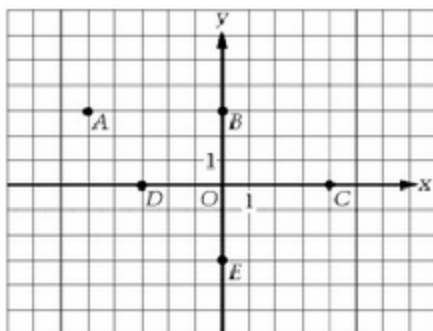
7) Assistent #392956 "392956 - Assistent #392956"

Which of the following is equivalent to $1-2x > 3(x-2)$?

- ☐ A. $1-2x > 3x-2$
☐ B. $1-2x > 3x-5$
☐ C. $1-2x > 3x-6$
☐ D. $1-2x > 3x-7$

8) Assistent #392957 "392957 - Assistent #392957"

The graph below shows the lettered points in an (x,y) coordinate system. Which lettered point has coordinates (-3,0)?



- ☐ A. A
☐ B. B
☐ C. C
☐ D. D
☐ E. E

9) Assistent #392958 "392958 - Assistent #392958"

Which of the following equations is modeled on the number line below?



- ☐ A. $0 + (-5) + (-3) = -3$
- ☐ B. $0 + 3 + (-2) = -5$
- ☐ C. $0 + (-3) + 2 = -5$
- ☐ D. $0 + (-5) + 2 = -3$

10) Assistent #392959 "392959 - Assistent #392959"

Which expression has the smallest value?

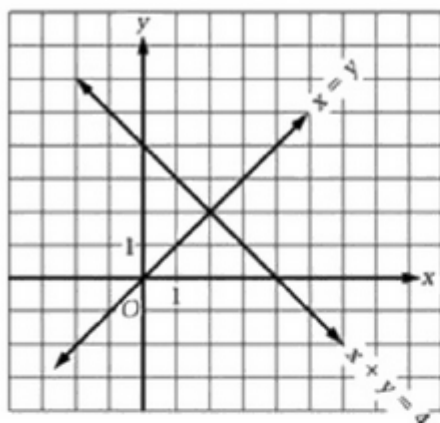
- ☐ A. $|-19|$
- ☐ B. $|-34|$
- ☐ C. $|11|$
- ☐ D. $|47|$

Appendix E.5: Moving Straight Ahead Test Questions

Problem Set "Moving Straight Ahead - Pretest" id:[126266]

1) Assistent #393390 "393390 - Which point is..."

Which point is the solution to both equations show on the graph below?



- ☐ A. (0,0)
- ☐ B. (0,4)
- ☐ C. (1,1)
- ☐ D. (2,2)
- ☐ E. (4,0)

2) Assistent #393391 "393391 - Find the slope..."

Find the slope of the line that passes through the pair of points.

(1,7), (10,1)

- ☐ A. $\frac{3}{2}$
- ☐ B. $-\frac{2}{3}$
- ☐ C. $-\frac{3}{2}$
- ☐ D. $\frac{2}{3}$

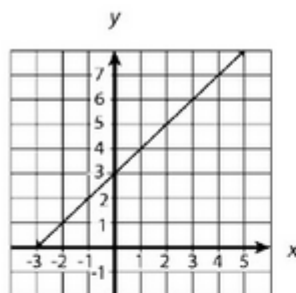
3) Assistent #393392 "393392 - A plumber charges..."

A plumber charges customer \$48 for each hour worked plus an additional \$9 for travel. If h represents the number of hours worked, which of the following expressions could be used to calculate the plumber's total charge in dollars?

- ☐ A. $48 + 9 + h$
- ☐ B. $48 \times 9 \times h$
- ☐ C. $48 + (9 \times h)$
- ☐ D. $(48 \times 9) + h$
- ☐ E. $(48 \times h) + 9$

4) Assistent #393393 "393393 - What is the equation...."

What is the equation of the graph shown below?



- ☐ A. $y = x - 1$
☐ B. $y = x + 1$
☐ C. $y = x + 3$
☐ D. $y = x - 3$

5) Assistent #393394 "393394 - ...cost of renting a bicycle..."

The data in the table show the cost of renting a bicycle by the hour, including a deposit.

Renting a Bicycle

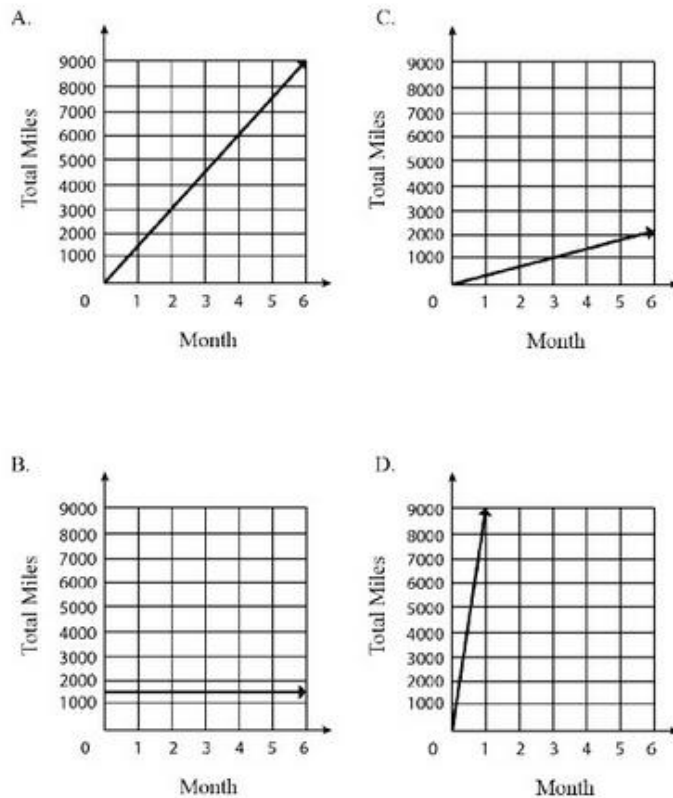
| Hours (h) | Cost in dollars (c) |
|---------------|-------------------------|
| 2 | 15 |
| 5 | 30 |
| 8 | 45 |

If hours, h , were graphed on the horizontal axis and cost, c , were graphed on the vertical axis, what would be the equation of a line that fits the data?

- ☐ A. $c = 5h$
☐ B. $c = (1/5)h + 5$
☐ C. $c = 5h + 5$
☐ D. $c = 5h - 5$
-

6) Assistent #393395 "393395 - Mario drives..."

Mario drives 1500 miles every month. Which line plot correctly represents Mario's total miles driven over a period of six months?



- ☐ A.
☐ B.
☐ C.
☐ D.

7) Assistent #393396 "...data sets is linear?"

Which of the following data sets is linear?

A.

| | | | | |
|---|---|---|----|----|
| x | 3 | 4 | 5 | 6 |
| y | 5 | 7 | 10 | 15 |

C.

| | | | | |
|---|---|----|----|----|
| x | 3 | 4 | 5 | 6 |
| y | 9 | 16 | 25 | 36 |

B.

| | | | | |
|---|---|---|----|----|
| x | 3 | 4 | 5 | 6 |
| y | 6 | 9 | 12 | 15 |

D.

| | | | | |
|---|---|---|----|----|
| x | 3 | 4 | 5 | 6 |
| y | 3 | 9 | 27 | 81 |

- ☐ A.
☐ B.
☐ C.
☐ D.

8) Assistent #393397 "393397 - What is the equation of the line..."

What is the equation of the line that has a slope of 4 and passes through the point (3, -10)?

- ☐ A. $y = 4x - 22$
- ☐ B. $y = 4x + 22$
- ☐ C. $y = 4x - 43$
- ☐ D. $y = 4x + 43$

9) Assistent #393398 "393398 - Solve the equation."

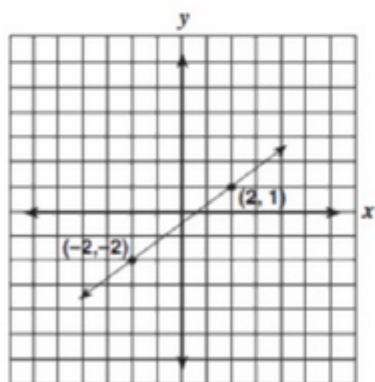
Solve the equation.

$$-6x = -36$$

- ☐ A. -6
- ☐ B. $1/6$
- ☐ C. 216
- ☐ D. 6

10) Assistent #393399 "393399 - What is the slope..."

What is the slope of this line?



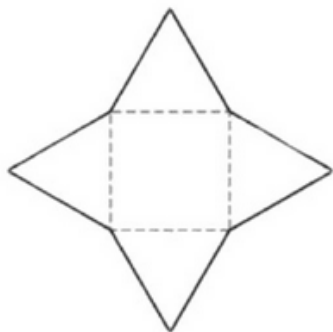
- ☐ A. $1/2$
 - ☐ B. $3/4$
 - ☐ C. 1
 - ☐ D. $4/3$
-

Appendix E.6: Filling and Wrapping Test Questions

Problem Set "Filling and Wrapping - Pretest" id[132675]

1) Assistent #393380 "393380 - What three dim..."

What three dimensional shape could be made by folding the figure below on the dotted lines until the points on the triangles meet?



- ☐ A. Triangle
- ☐ B. Pyramid
- ☐ C. Cube
- ☐ D. Cone

2) Assistent #393381 "393381 - Oranges are packed..."

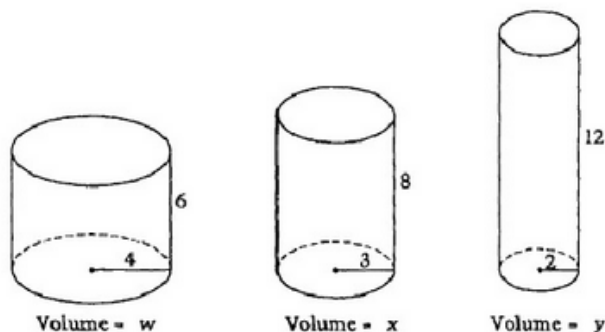
Oranges are packed in boxes. The average diameter of the oranges is 6 cm, and the boxes are 60 cm long, 36 cm wide, and 24 cm deep.

Which of these is the BEST approximation of the number of oranges that can be packed in a box?

- ☐ A. 30
- ☐ B. 240
- ☐ C. 380
- ☐ D. 1920

3) Assistent #393382 "393382 - ...the radius and height..."

In the figures below, the radius and height of each right circular cylinder are given. If w , x , and y represent the respective volumes of the cylinders, which of the following statements is true?



- ☐ A. $y = w = x$
- ☐ B. $y < x < w$
- ☐ C. $y < w < x$
- ☐ D. $w < y < x$
- ☐ E. $w < x < y$

4) Assistent #393383 "393383 - A box is in the shape..."

A box is in the shape of a rectangular prism and has a volume of 360 cubic inches. The box has a width of 6 inches and a length of 10 inches.

What is the height of the box?

- ☐ A. 6 inches
- ☐ B. 10 inches
- ☐ C. 23 inches
- ☐ D. 36 inches

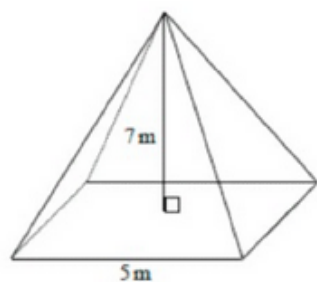
5) Assistent #393384 "393384 - Maurice's family put..."

Maurice's family put a pool into their backyard. It is rectangular in shape and its dimensions are 20 feet by 10 feet by 10 feet. It costs \$0.05 per cubic foot to fill the pool. How much will it cost Maurice's family to fill their new pool?

- ☐ A. \$100
- ☐ B. \$200
- ☐ C. \$150
- ☐ D. \$50

6) Assistent #393385 "393385 - Find the volume..."

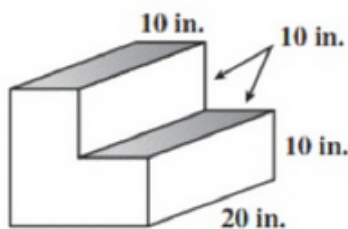
Find the volume of the square pyramid to the nearest cubic unit.



- ☐ A. 175 cubic meters
- ☐ B. 233 cubic meters
- ☐ C. 58 cubic meters
- ☐ D. 88 cubic meters

7) Assistent #393386 "393386 - The short stairway..."

The short stairway shown below is made of solid concrete. The height and width of each step is 10 inches (in.). The length is 20 inches.

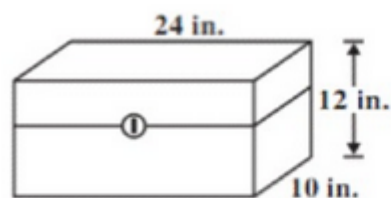


What is the volume, in cubic inches, of the concrete used to create this stairway?

- ☐ A. 3000
- ☐ B. 4000
- ☐ C. 6000
- ☐ D. 8000

8) Assistentment #393387 "393387 - Gina is painting..."

Gina is painting the rectangular tool chest shown in the diagram below.



If Gina paints only the outside of the tool chest, what is the total surface area, in square inches, she will paint?

- ☐ A. 368
- ☐ B. 648
- ☐ C. 1296
- ☐ D. 2880

9) Assistentment #393388 "393388 - A cone has a radius..."

A cone has a radius of 15 cm and a volume of 540 cm^3 . Find the volume of a similar cone with a radius of 10 cm.

- ☐ A. 54 cubic centimeters
- ☐ B. 240 cubic centimeters
- ☐ C. 160 cubic centimeters
- ☐ D. 360 cubic centimeters

10) Assistentment #393389 "393389 - Amanda wants to..."

Amanda wants to paint each face of a cube a different color. How many colors will she need?

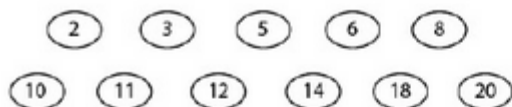
- ☐ A. Three
 - ☐ B. Four
 - ☐ C. Six
 - ☐ D. Eight
-

Appendix E.7: What Do You Expect? Test Questions

Problem Set "What Do You Expect - Pre-test" id[132712]

1) Assistent #393367 "393367 - The eleven chips..."

The eleven chips shown below are placed in a bag and mixed.



Chelsea draws one chip from the bag without looking. What is the probability that Chelsea draws a chip with a number that is a multiple of three?

- ☐ A. $1/11$
- ☐ B. $1/3$
- ☐ C. $4/11$
- ☐ D. $4/7$

2) Assistent #381983 "381983 - J'Mesha and Aarti..."

J'Mesha and Aarti each bought a gift and wanted to have it wrapped at the store. The store offers 2 designs of paper (solid or polka dots) and each design comes in 3 different colors. If the clerk chooses the paper randomly, what is the probability that the gifts will get wrapped identically?

- ☐ A. $1/2$
- ☐ B. $1/3$
- ☐ C. $2/6$
- ☐ D. $1/6$

3) Assistent #381984 "381984 - Justine decides t..."

Justine decides to toss 2 coins 100 times. Which results should occur most often?

- ☐ A. Two heads
- ☐ B. Two tails
- ☐ C. One head, one tail
- ☐ D. All of these combinations are equally likely

4) Assistent #381985 "381985 - Fran has 16 CDs i..."

Fran has 16 CDs in a box: 6 country, 6 rock, 2 dance, and 2 classical. If she takes out one CD without looking, what is the probability that she will pick a rock or country CD?

- ☐ A. 25%
 - ☐ B. 50%
 - ☐ C. 75%
 - ☐ D. 100%
-

5) Assistent #386459 "386459 - Ken has a box tha..."

Ken has a box that contains 12 marbles. The table below shows the number of marbles of each color that are in the box.

| Color | Number of Marbles |
|--------|-------------------|
| Yellow | 5 |
| Green | 3 |
| Orange | 2 |
| Blue | 2 |

Ken randomly selects 2 marbles from the box and keeps them. If Ken then randomly selects a third marble from the box, the probability that he will select a green marble is $\frac{2}{10}$. Which of the following statements could be true about the first 2 marbles Ken selected?

- ☐ A. One was yellow and one was green.
- ☐ B. One was orange and one was yellow.
- ☐ C. One was orange and one was blue.
- ☐ D. Both were green.
- ☐ E. Both were yellow.

6) Assistent #386460 "386460 - Each of the 6 fac..."

Each of the 6 faces of a fair cube is painted red, yellow, or blue. This cube is rolled 500 times. The table below shows the number of times each color landed faced up.

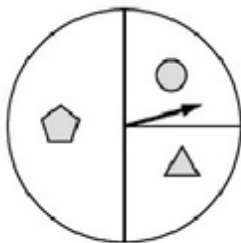
| Color | Red | Yellow | Blue |
|-------|-----|--------|------|
| Total | 100 | 340 | 60 |

Based on these results, what is the most likely number of yellow faces on the cube?

- ☐ A. One
- ☐ B. Two
- ☐ C. Three
- ☐ D. Four
- ☐ E. Six

7) Assistent #386461 "386461 - If Rose spins a s..."

If Rose spins a spinner like the one below 300 times, about how many times should she expect it to land on the space with a circle?



- ☐ A. 75
- ☐ B. 90
- ☐ C. 100
- ☐ D. 120
- ☐ E. 150

8) Assistentment #393369 "393369 - A game involves..."

A game involves spinning this spinner.

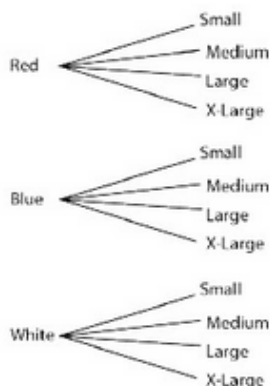


What is the probability of the pointer landing on G?

- ☐ A. $\frac{3}{8}$
- ☐ B. $\frac{1}{8}$
- ☐ C. $\frac{1}{2}$
- ☐ D. $\frac{5}{8}$

9) Assistentment #393370 "393370 - A store is selling..."

A store is selling USA Spirit T-shirts. the shirts are available in red, blue, and white. Shirts of each colour are available in sizes small, medium, large, and extra large.



Aimee will randomly select one shirt from a shelf. If the shelf contains equal numbers of shirts in each color and size combination, what is the probability that Aimee will select a large shirt?

- ☐ A. $\frac{1}{12}$
- ☐ B. $\frac{1}{4}$
- ☐ C. $\frac{1}{3}$
- ☐ D. $\frac{11}{12}$

10) Assistentment #393371 "393371 - The table below..."

The table below shows the gender and color of 7 puppies. If a puppy selected at random from the group is brown, what is the probability it is a male?

| GENDER AND COLOR OF PUPPIES | | |
|-----------------------------|------|--------|
| | Male | Female |
| Black | 1 | 2 |
| Brown | 1 | 3 |

- ☐ A. $\frac{1}{4}$
- ☐ B. $\frac{2}{7}$
- ☐ C. $\frac{1}{3}$
- ☐ D. $\frac{1}{2}$
- ☐ E. $\frac{2}{3}$

Appendix E.8: Data Distributions Test Questions

Problem Set "Data Distributions - Pre-test" id[132718]

1) Assistent #393372 "393372 - ...scores for a class..."

The table shows scores for a class on a 10-point test.

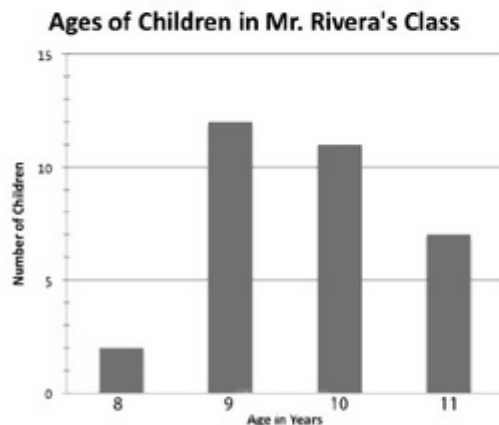
| Test Score | Tally | Frequency |
|------------|--------|-----------|
| 4 | I | 1 |
| 5 | III | 3 |
| 6 | IIII I | 6 |
| 7 | II | 2 |
| 8 | IIII | 4 |
| 9 | III | 3 |
| 10 | I | 1 |

How many in the class had a score greater than 7?

- ☐ A.2
- ☐ B.8
- ☐ C.10
- ☐ D.12
- ☐ E.20

2) Assistent #393373 "393373 - ...Mr. Rivera's class..."

The graph below shows how many of the 32 children in Mr. Rivera's class are 8, 9, 10, and 11 years old.



Which of the following is true?

- ☐ A. Most are younger than 9.
- ☐ B. Most are younger than 10.
- ☐ C. Most are 9 or older.
- ☐ D. None of the above is true.

3) Assistent #393374 "393374 - ...high and low temp..."

The table below shows the high and low temperatures on October 1st for five cities.

TEMPERATURES ON OCTOBER 1ST FOR FIVE CITIES (IN °F)

| | High | Low |
|--------|------|-----|
| City A | 72 | 50 |
| City B | 90 | 75 |
| City C | 83 | 72 |
| City D | 50 | 37 |
| City E | 92 | 72 |

Which city had the greatest temperature range?

- ☐ A.City A
☐ B.City B
☐ C.City C
☐ D.City D
☐ E.City E

4) Assistent #393375 "393375 - Jared scored..."

Jared scored the following numbers of points in his last 7 basketball games: 8, 21, 7, 15, 9, 15, and 2.

What is the median number of points scored by Jared in these 7 games?

- ☐ A.9
☐ B.11
☐ C.15
☐ D.19

5) Assistent #381907 "381907 - Abe found the mea..."

Abe found the mean and median of this list of numbers.

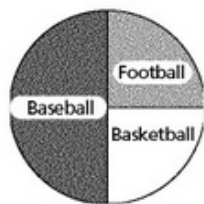
1, 3, 3

If the number 6 were added to the list, then

- ☐ A.the mean would increase.
☐ B.the mean would decrease.
☐ C.the median would increase.
☐ D.the median would decrease

6) Assistent #393376 "393376 - Peter collects cards..."

Peter collects cards showing professional sports players in different sports. This graph shows the proportions of the different types of sports cards in Peter's collection.



If Peter has 60 cards in his collection, how many baseball, football, and basketball cards does he have?

- ☐ A.20 baseball, 20 football, and 20 basketball
☐ B.30 baseball, 20 football, and 10 basketball
☐ C.30 baseball, 15 football, and 15 basketball
☐ D.40 baseball, 10 football, and 10 basketball

7) Assistent #381908 "381908 - Javier's test sco..."

Javier's test scores were 85, 85, 97, 98, and 100. His teacher told the class that they could choose which measures of center they wanted her to use to determine final grades. Which measure do you suggest that Javier choose to receive the highest grade?

- ☐ A. Mean
☐ B. Median
☐ C. Mode
☐ D. Range

8) Assistent #393377 "393377 - Gloria's diving scores..."

Gloria's diving scores from a recent competition are represented in the stem-and-leaf plot shown below. In this plot, 3/4 would be read as 3.4.

Diving Scores

| | | | |
|---|--|---|---|
| 5 | | 2 | 5 |
| 6 | | 1 | |
| 7 | | 7 | |
| 8 | | 0 | 2 |

What was her lowest score for this competition?

- ☐ A. 0.02
☐ B. 1.0
☐ C. 2.5
☐ D. 5.2
☐ E. 8.0

9) Assistent #393378 "393378 - ...sandwiches sold by Derby's..."

The table below shows the numbers of turkey and ham sandwiches sold by Derby's Deli for several days in one week.

| Sandwiches Sold at Derby's Deli | | |
|---------------------------------|--------|-----|
| Day | Turkey | Ham |
| Monday | 7 | 9 |
| Tuesday | 13 | 11 |
| Wednesday | 8 | 8 |
| Thursday | 15 | 6 |
| Friday | 12 | 16 |

What is the difference between the median number of turkey sandwiches sold and the median number of ham sandwiches sold?

- ☐ A. 0
☐ B. 1
☐ C. 2
☐ D. 3

10) Assistentment #393379 "393379 - ...scores...final exam..."

The table below shows the scores of 10 students on a final examination. What is the range of these scores?

| Student | Score |
|---------|-------|
| A | 88 |
| B | 65 |
| C | 91 |
| D | 36 |
| E | 72 |
| F | 57 |
| G | 50 |
| H | 85 |
| I | 62 |
| J | 48 |

- ☐ A.33
- ☐ B.40
- ☐ C.55
- ☐ D.88